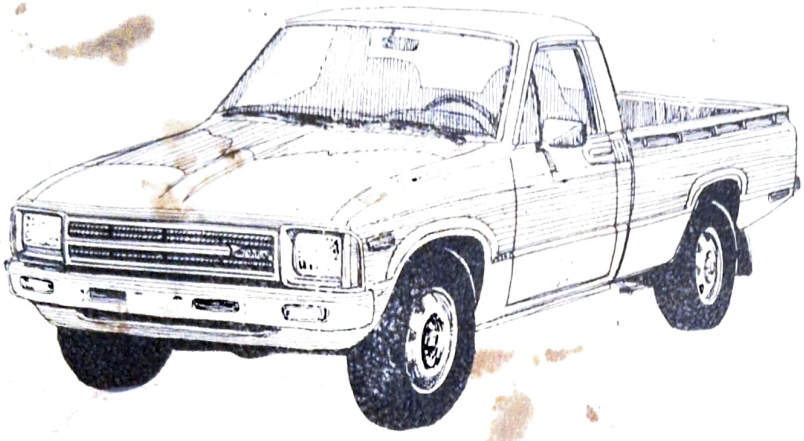
TOYOTA TRUCK



pickup

1982 Repair Manual

- Engine
- Chassis
- Body
- Electrical
- Specifications

FOR USA & CANADA Pub. No. 361

FOREWORD

This manual contains maintenance and repair procedures for the 1982 Truck (Pickup) and Truck 4WD (Pickup 4WD).

Applicable models:

RN34L series
RN44L series
RN44L-W3 series (Cab & Chassis)
RN38L series (4WD)
RN48L series (4WD)

The manual is divided into 19 sections and 2 appendixes with a thumb index for each section at the edge of the pages.

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

TOYOTA MOTOR SALES CO., LTD.

1982 TOYOTA TRUCK PICKUP REPAIR MANUAL

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HOW TO USE THIS MANUAL

To assist in finding your way through the manual, the Section Title and major heading are given at the top of every page.

An **INDEX** is provided on the first page of each section to guide you to the item to be repaired.

At the beginning of each section, **PRECAUTIONS** are given that pertain to *all* repair operations contained in that section. *Read these precautions before starting any repair task.*

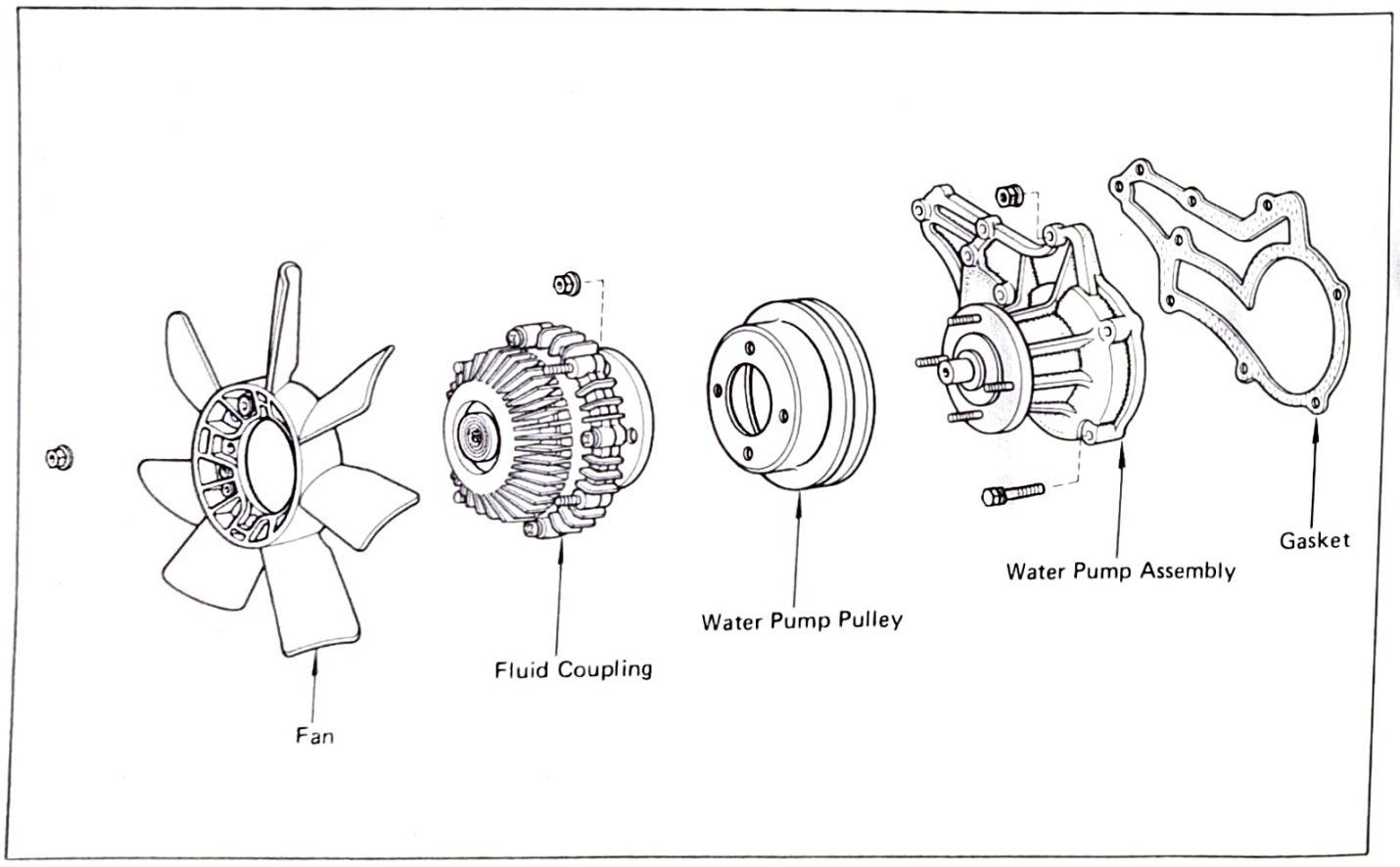
TROUBLESHOOTING tables are included for each system to help you diagnose the system problem and find the cause. The repair for each possible cause is referenced in the remedy column to quickly lead you to the solution.

SPECIAL TOOLS AND TEST EQUIPMENT, designed to be used for the repair of each component, are listed in the front of each section. Special Service Tools (SST), should be used where specified. If a SST is not available, an equivalent commercial tool may be used when stated. These tools are also given at each step where they are required for repair.

REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

Example:



The procedures are presented in a step-by-step format:

- The photo or illustration shows *what* to do and *where* to do it.
- The task heading tells *what* to do.
- The detailed text tells *how* to perform the task and gives other information such as specifications and warnings.

Example:

Photograph or illustration: what to do and where

Task heading: what to do

INSTALL DRIVE SHAFT ON CENTER SUPPORT BEARING FLANGE

(a) Align the marks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque: 2.0 — 4.0 kg-m (15 — 28 ft-lb)

Detail text: how to do it

Specification

This format enables the experienced technician to have a FAST TRACK. He can read the task headings and only refer to the detailed text when he needs it. Important specifications and warnings always stand out in bold type.

REFERENCES

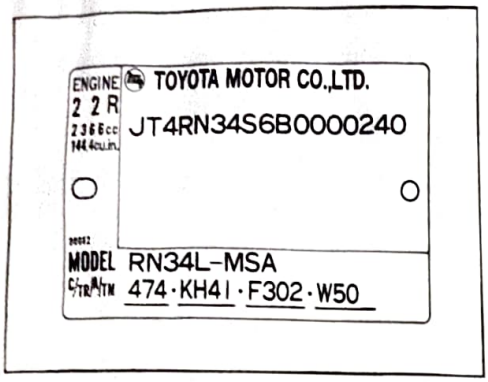
References have been kept to a minimum. However, when they are required you are given the *page* to go to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text in the applicable step. You never have to leave the procedure to look up your specs. All specifications are also found in Appendix A, Specifications for quick reference.

WARNINGS, CAUTIONS, NOTES:

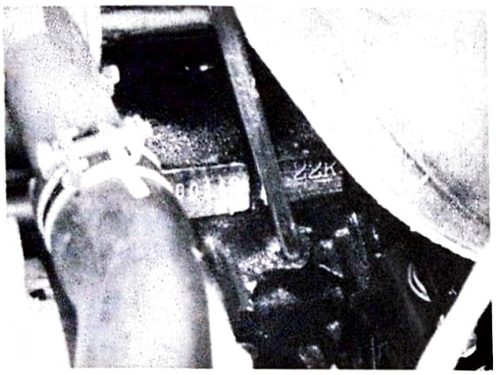
- WARNINGS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- CAUTIONS are also presented in bold type, and indicate there is a possibility of damage to the components being repaired.
- NOTES are separated from the text but do not appear in bold. They provide additional information to more efficiently help you perform the repair.



IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the right front fender apron of the engine compartment. This number is also stamped on the driver's door post.

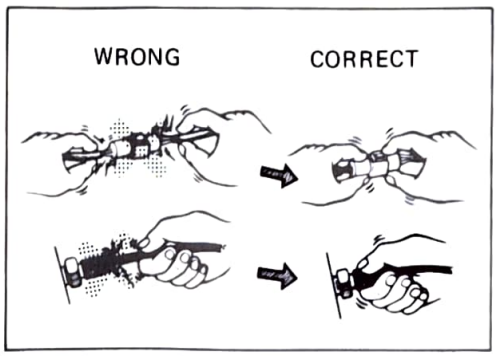


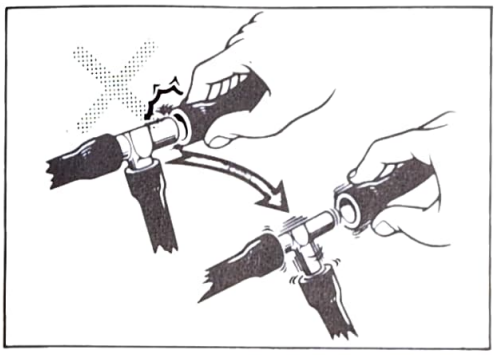
ENGINE SERIAL NUMBER

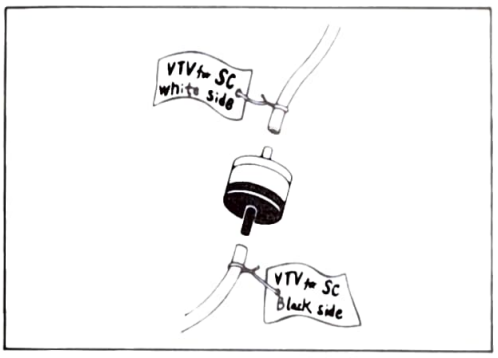
The engine serial number is stamped on the left side of the cylinder block, behind the alternator.

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in order to facilitate reassembly.
3. Before performing electrical work, disconnect one of the cables from the battery terminal.
4. Before performing electrical work, disconnect one of the cables from the battery terminal.
5. Always replace cotter pins gaskets and O-rings with new ones.
6. When necessary, use a sealer on gaskets to prevent leaks.
7. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
8. Use of special service tools (SST) may be required, depending on the nature of the repair. Be sure to use SST where specified and follow the proper work procedure.
9. When replacing fuses, be sure the new fuse is the correct amperage rating. DO NOT exceed the fuse amp rating or use one of a lower rating.
10. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations. (See page 1-7)
    (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety.
    (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone, even for a small job that can be finished quickly.







11. Observe the following precautions to avoid damage to the parts:
    (a) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    (b) To pull apart electrical connectors, pull on the connector itself, not the wires.
    (c) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
    (d) When steam cleaning an engine, protect the distributor, coil, air filter, carburetor intake, air pump and EGR vacuum modulator from water.
    (e) Never use an impact wrench to remove or install thermo switches or thermo sensors.
    (f) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
    (g) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter instead. Once the hose has been stretched, it may leak.
12. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

PRECAUTIONS FOR VEHICLES EQUIPPED WITH A CATALYST

WARNING: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. **Use only unleaded gasoline.**
2. **Avoid prolonged idling.**

   Avoid running the engine at fast idle speed for more than 10 minutes and at idle speed for more than 20 minutes.
3. **Avoid spark jump test.**
   (a) Spark jump only when absolutely necessary. Perform this test as rapidly as possible.
   (b) While testing, never race the engine.
4. **Avoid prolonged engine compression measurement.**

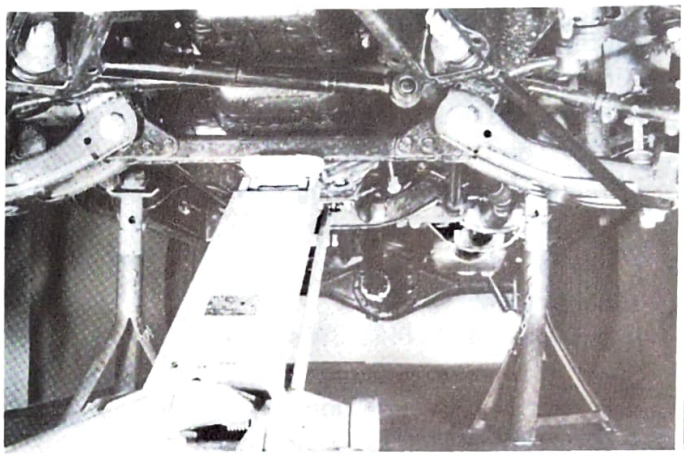
   Engine compression tests must be made as rapidly as possible.
5. **Do not run engine when fuel tank is nearly empty.**

   This may cause the engine to misfire and create an extra load on the converter.
6. **Avoid coasting with ignition turned off and prolonged braking.**
7. **Do not dispose of used catalyst along with parts contaminated with gasoline or oil.**

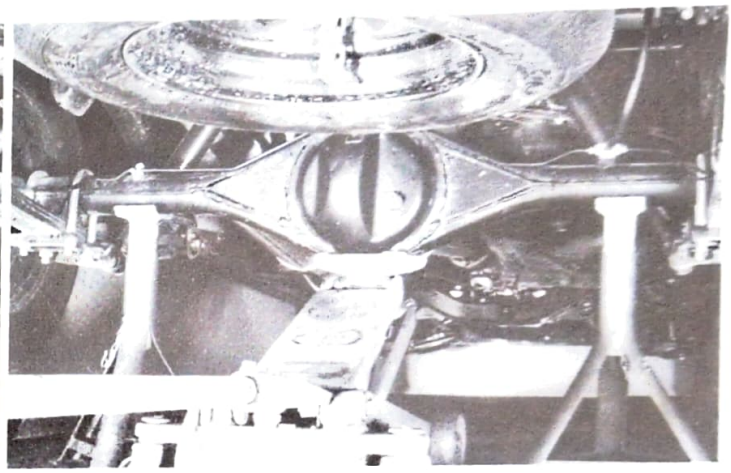
VEHICLE LIFT AND SUPPORT LOCATIONS

PICKUP

Front

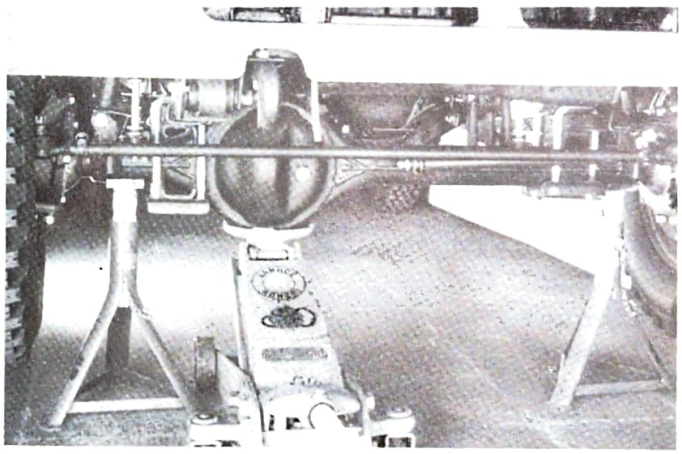


Rear

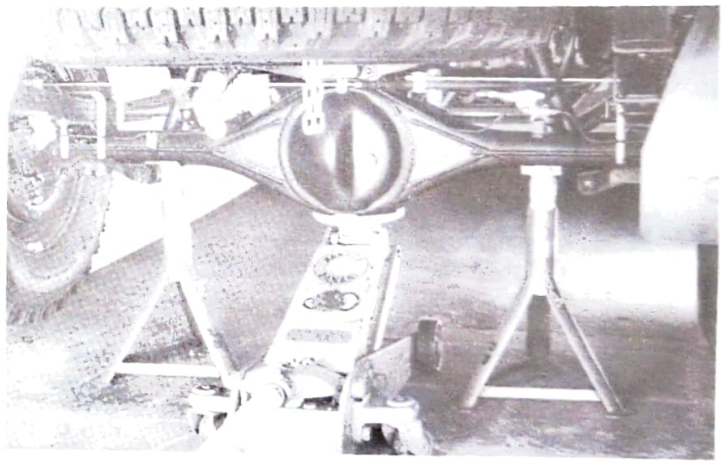


PICKUP 4WD

Front



Rear



ABBREVIATIONS USED IN THIS MANUAL

AAP	Auxiliary Acceleration Pump
A/C	Air Conditioner
ACV	Air Control Valve
AI	Air Injection
AS	Air Suction
ASV	Air Switching Valve
A/T	Automatic Transmission
BTDC	Before Top Dead Center
BVSV	Bi-metal Vacuum Switching Valve
CALIF.	Vehicles Sold In California
CANADA	Vehicles Sold In Canada
CB	Choke Breaker
C & C	Cab & Chassis (RN44L-3W series)
EGR	Exhaust Gas Recirculation
EVAP	Evaporative (Emission Control)
EX.	Exhaust (manifold, valve) or Except
FEDERAL	Vehicles Sold In USA Except California
HAC	High Altitude Compensation
HAI	Hot Air Intake
HIC	Hot Idle Compensation
IN.	Intake (manifold, valve) or Inch
IG	Ignition
MAS	Mixture Adjusting Screw
MC	Mixture Control
MP	Multipurpose
M/T	Manual Transmission
OC	Oxidation Catalyst
OPT	Option
OD	Overdrive
O/S	Oversized
PCV	Positive Crankcase Ventilation
P/S or P.S.	Power Steering
SC	Spark Control
SST	Special Service Tool
STD	Standard
S/W	Switch
T/M	Transmission
TP	Throttle Positioner
TVSV	Thermostatic Vacuum Switching Valve
TWC	Three Way Catalyst
U/S	Undersized
VCV	Vacuum Control Valve
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
W/	With
W/O	Without
4x2	Two Wheel Drive Vehicles (RN34L & 44L series)
4x4	Four Wheel Drive Vehicles (RN38L & 48L series)

MAINTENANCE

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MINOR MAINTENANCE–B	2-5
MAJOR MAINTENANCE	2-15
MAINTENANCE UNDER SEVERE CONDITIONS	2-33
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GENERAL NOTES:

- Every service item in the periodic maintenance list must be performed.
- Failure to do even one item can cause the engine to run poorly and can increase exhaust emissions.

MAINTENANCE SCHEDULE

Maintenance operations: A = Check and/or adjust if necessary;
R = Replace, change or lubricate;
I = Inspect and correct or replace as necessary

System	Service interval / Maintenance items		Odometer reading or months, whichever comes first			
		Miles x 1,000	15	30	45	60
		Kilometers x 1,000	24	48	72	96
		Months	12	24	36	48
ENGINE	Valve clearance (2)		A	A	A	A
	Drive belts (including power steering and air conditioner drive belt)	Fed. Canada		R		R
		Calif.		A, (R*)		R
	Engine oil and oil filter (1)		Change every 10,000 miles (16,000 km) or 8 months			
	Engine coolant			R		R
	Cooling and heating systems, hoses and connections					I
	Exhaust pipes and mountings (1)		I	I	I	I
FUEL	Idle speed and fast idle speed (2)		A*	A*		A
	Choke system		I*	I		I
	Fuel filter					R
	Air filter (1)			R		R
	Fuel lines and connections			I		I
	Fuel filler cap			I*		I, (R) (4)
IGNITION	Spark plugs	Fed. Canada	R	R	R	R
		Calif.		R		R
	Ignition wiring (1), (3)	Fed. Canada		I		I
		Calif.				I
EMISSION CONTROL	PCV system	Fed. Canada		I, (R) (5)		I, (R) (5)
		Calif.				I, (R) (5)
	Charcoal canister			I*		I
	Fuel evaporative emission control system, hoses and connections			I*		I
TRANSMISSION	Transmission, transfer (for RN 4x4) and differential oil (1)		I	I	I	I
BRAKES	Brake linings and drums (1)		I	I	I	I
	Brake pads and discs (1)		I	I	I	I
	Brake line pipes and hoses		I	I	I	I
CHASSIS	Steering linkage and gear box (1)		I	I	I	I
	Ball joints and dust covers (1) (RN 4x2)		I	I	I	I
	Wheel bearing and ball joint grease			R		R
	Steering knuckle and chassis grease (1) (RN 4x4)		R	R	R	R
	Propeller shaft grease (1) (RN 4x4)		R	R	R	R
	Bolts and nuts on chassis and body (1)		I	I	I	I

* The items marked with an asterisk are recommended maintenance items for California vehicles only, but are required maintenance items for Federal and Canada.

NOTE:

(1) For vehicles normally used under any of the following severe conditions, the applicable items of maintenance should be performed as indicated in the table below.

Maintenance items	Service interval		Severe condition
Engine oil and oil filter	R	Every 3,750 miles (6,000 km) or 3 months	A . . D . F
Exhaust pipes and mountings	I	Every 7,500 miles (12,000 km) or 6 months	A B C . E .
Air filter	I	Every 3,750 miles (6,000 km) or 3 months	. . . D . .
	R	Every 30,000 miles (48,000 km) or 24 months	
Ignition wiring (3)	I	Every 12 months	. . . . E .
Distributor cap (3)	I	Every 12 months	. . . . E .
Brake linings and drums	I	Every 7,500 miles (12,000 km) or 6 months	A B C D . .
Brake pads and discs	I	Every 7,500 miles (12,000 km) or 6 months	A B C D . .
Steering linkage and gear box	I	Every 7,500 miles (12,000 km) or 6 months	. . C . . .
Ball joints and dust covers (RN 4x2)	I	Every 7,500 miles (12,000 km) or 6 months	. . C D E .
Transmission, transfer (RN 4x4) and differential oil	R	Every 15,000 miles (24,000 km) or 12 months	A . C . . .
Automatic transmission fluid (RN 4x2)	R	Every 15,000 miles (24,000 km) or 12 months	A . C . . .
Steering knuckle and chassis grease (RN 4x4)	R	Every 7,500 miles (12,000 km) or 6 months	. . C . . .
Propeller shaft grease (RN 4x4)	R	Every 7,500 miles (12,000 km) or 6 months	A . C . . (7)
Bolts and nuts on chassis and body (6)	I	Initial 3,750 miles (6,000 km) or 3 months and every 7,500 miles (12,000 km) or 6 months	. . C . . .

"Severe conditions"

A – Pulling trailers
B – Repeated short trips
C – Driving on rough and/or muddy roads
D – Driving on dusty roads
E – Operating in extremely cold weather and/or driving in areas using road salt
F – Repeated short trips in extremely cold weather

(2) Specifications appear on the information label.

(3) In areas where road salt is used, inspection and cleaning of the distributor cap and ignition wiring should be performed each year just after the snow season.

(4) Replace only the gasket.

(5) Replace only the PCV valve.

(6) In addition to the scheduled maintenance items, check for loose or missing bolts and nuts of the following:

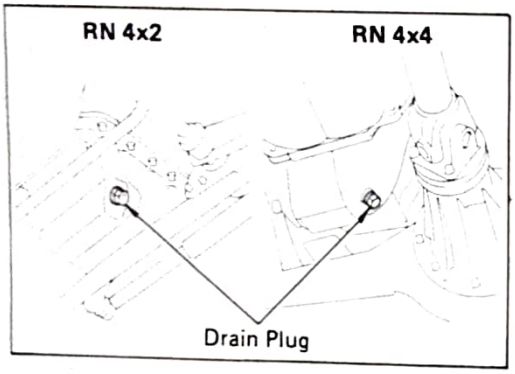
- Steering system
- Drive train
- Suspension system
- Fuel tank mounts
- Engine mounts, etc.

(7) If the propeller shaft has been immersed in water, it should be re-greased within 24 hours (Double-cardan joint only).

MINOR MAINTENANCE AT	10 · 20 · 40 · 50	x 1,000 MILES
	16 · 32 · 64 · 80	x 1,000 KM
	8 · 16 · 32 · 40	MONTHS

MINOR MAINTENANCE–A

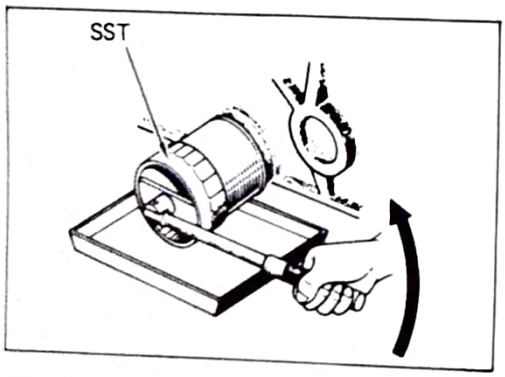
Order	Maintenance items	Specifications	Page
	ENGINE		
1	Replace engine oil and oil filter (Change every 10,000 miles; 16,000 km)	Engine oil capacity (Drain and refill with oil filter change): 4.6 liters (4.9 US qts, 4.0 Imp. qts)	2-4



ENGINE

1. REPLACE ENGINE OIL AND OIL FILTER (Change every 10,000 miles; 16,000 km)

(a) With the engine warm, remove the oil drain plug and drain the oil.

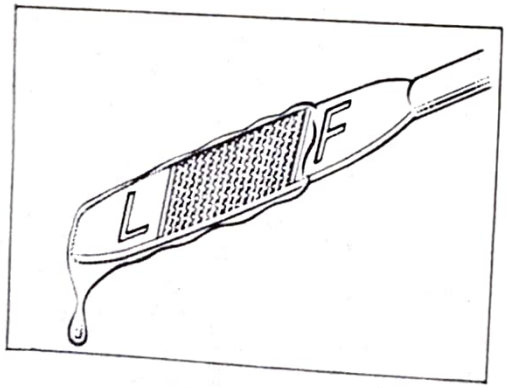


(b) Using SST, remove the oil filter (located on the engine block below the carburetor).

SST 09228-44010

(c) Install a new oil filter.

- Put a light coat of engine oil on the gasket.
- Hand tighten ONLY. DO NOT use a wrench to tighten the filter.



(d) Clean and install the oil drain plug with the gasket.

(e) Fill the engine with new oil, API grade SE or better.

Engine oil capacity (Drain and refill with oil filter change): 4.6 liters (4.9 US qts, 4.0 Imp. qts)

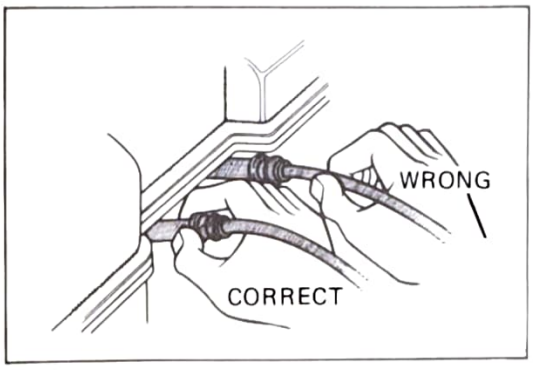
MINOR MAINTENANCE AT	15 · 45	x 1,000 MILES
	24 · 72	x 1,000 KM
	12 · 36	MONTHS

MINOR MAINTENANCE–B

Order	Maintenance items	Specifications	Page
	ENGINE		
	(Cold Engine Operations)		
1	Replace spark plugs (ex. Calif.)	Gap: 0.8 mm (0.031 in.)	2-7
2	Inspect choke system (15,000 miles; 24,000 km only*)		2-7
3	Inspect exhaust pipes and mountings		2-7
	(Hot Engine Operations)		
4	Adjust valve clearance	Valve clearance: Intake 0.20 mm (0.008 in.) Exhaust 0.30 mm (0.012 in.)	2-7
5	Adjust idle speed (15,000 miles; 24,000 km only*)	Idle speed: 700 rpm M/T 750 rpm A/T	2-9
6	Adjust fast idle speed (15,000 miles; 24,000 km only*)	Fast idle speed (w/ EGR system OFF, vacuum advancer OFF and choke opener OFF): 2,600 rpm	2-9
	TRANSMISSION		
7	Check oil level in transmission, transfer (RN 4x4 only) and differential		2-11
	BRAKES		
8	Inspect brake line pipes and hoses		2-11
9	Inspect rear brake linings and drums	Minimum lining thickness: 1 mm (0.04 in.) Maximum drum inside diameter: 256.0 mm (10.079 in.)	2-12
10	Inspect front brake pads and discs	Minimum pad thickness: 1 mm (0.04 in.) Minimum disc thickness: RN C&C 19.0 mm (0.748 in.) Others 11.5 mm (0.453 in.) Maximum disc runout: 0.15 mm (0.0059 in.)	2-12

MINOR MAINTENANCE AT	15 · 45	x 1,000 MILES
	24 · 72	x 1,000 KM
	12 · 36	MONTHS

Order	Maintenance items	Specifications	Page
	CHASSIS		
11	RN 4x2 only: Inspect ball joints and dust covers	Maximum ball joint vertical play: 2.3 mm (0.091 in.)	2-12
12	Inspect steering linkage and gear box		2-12
13	RN 4x4 only: Lube steering knuckle and chassis (Including propeller shaft)		2-13
14	Tighten bolts and nuts on chassis and body		2-13
15	Final inspection		2-14

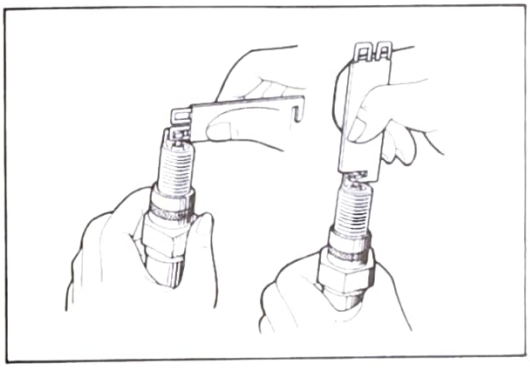


ENGINE

Cold Engine Operations

1. REPLACE SPARK PLUGS (Except Calif.)

(a) Disconnect the spark plug wires at the boot. DO NOT pull on the wires. Remove the spark plugs.



(b) Set the gap on the new plugs.

Gap: 0.8 mm (0.031 in.)

Recommended spark plugs:

ND W16EXR-U
NGK BPR5EY or BPR5EA-L

2. INSPECT CHOKE SYSTEM
(15,000 miles; 24,000 km only*)

(a) Remove the air cleaner.

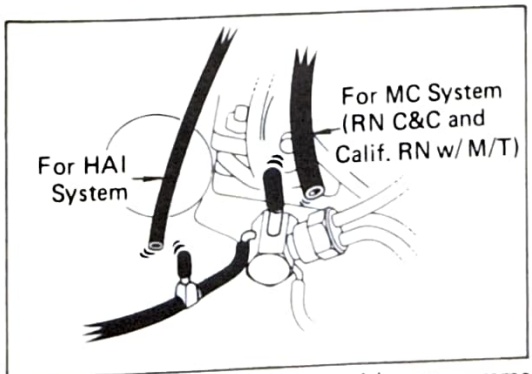
(b) Clean the choke shaft and linkage.

- Spray carburetor (or choke) cleaner on the choke linkage to remove dirt and dust.
- Spray carburetor (or choke) cleaner on both ends of the choke shaft while opening and closing the choke valve by hand.

3. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect pipes, hangers, and connections for severe corrosion, leaks or damage.

Hot Engine Operations



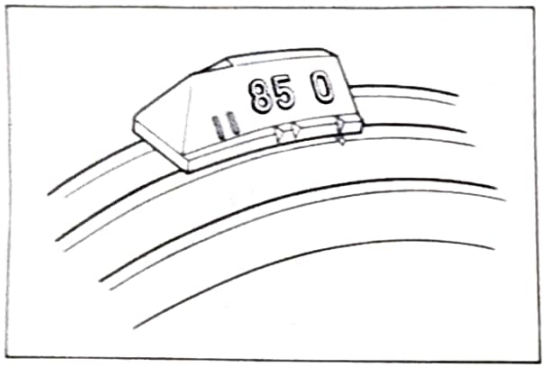
4. ADJUST VALVE CLEARANCE

NOTE: Before starting the engine, plug the hose connections for the HAI and MC systems (RN C&C and Calif. RN w/M/T) to prevent rough idling.

(a) Warm up the engine to normal operating temperature.

(b) Stop the engine and remove the valve cover.

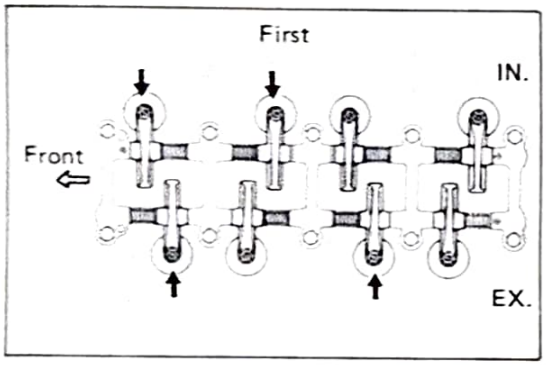
* The items marked with an asterisk are recommended maintenance items for California vehicles only, but are required maintenance items for Federal and Canada.



(c) Set No. 1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the 0 position.
- Check that the rocker arms on No. 1 cylinder are loose and rockers on No. 4 are tight.

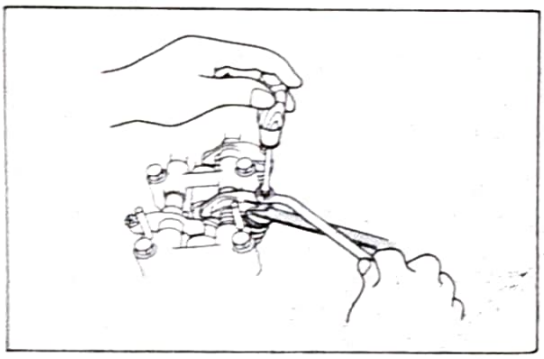
If not, turn the crankshaft one complete revolution and align marks as above.



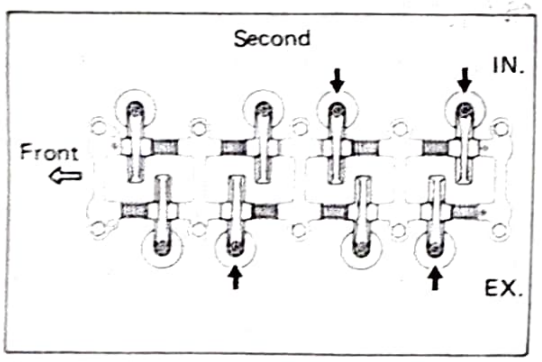
(d) Adjust the clearance of half of the valves.

- Adjust only those valves indicated by arrows.

Valve clearance: **Intake 0.20 mm (0.008 in.)**
Exhaust 0.30 mm (0.012 in.)



- Use a feeler gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position and tighten the lock nut.
- Recheck the clearance. The feeler gauge should move with a very slight drag.



(e) Turn the crankshaft one revolution and adjust the other valves.
Turn the crankshaft 360° and align timing marks in the manner mentioned above. Adjust only the valves indicated by arrows.

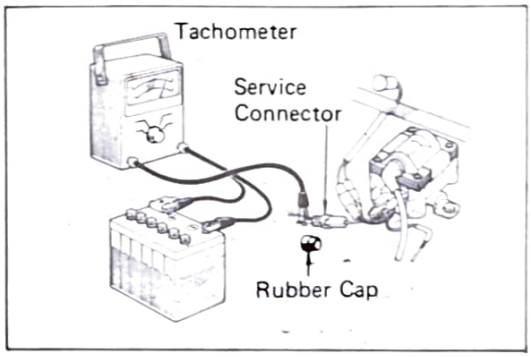
(f) Reinstall the valve cover.

(g) Reinstall the air cleaner.

5. ADJUST IDLE SPEED (15,000 miles; 24,000 km only*)

(a) Preparation

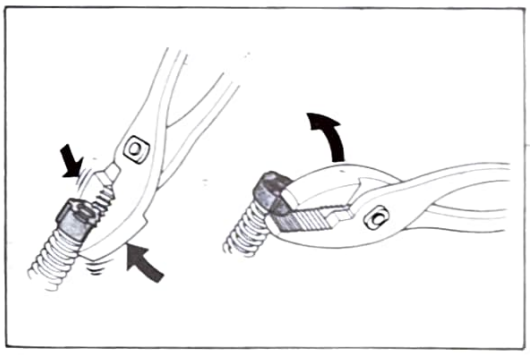
- Air cleaner installed
- Choke valve fully open
- Accessories switched off
- All vacuum lines connected (i.e. AI, EGR systems, etc.)
- Transmission in N range
- Engine idling at normal operating temperature



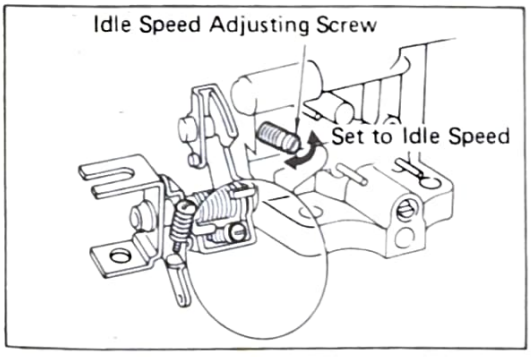
(b) Connect a tachometer to the engine.
Remove the rubber cap and connect the tachometer positive (+) terminal to the service connector from the igniter.

CAUTION:

1. **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
2. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**



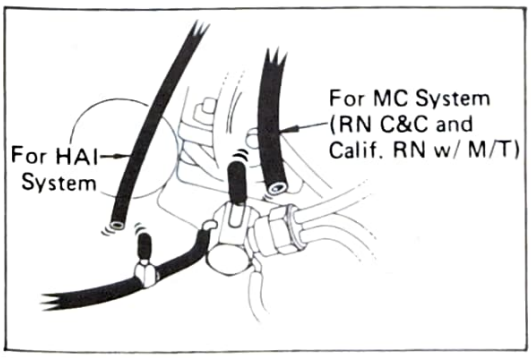
(c) Using pliers, break off the idle limiter cap on the idle speed adjusting screw, if installed.



(d) Set the idle speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle speed: 700 rpm M/T
750 rpm A/T

NOTE: Leave the tachometer connected for further adjustment.

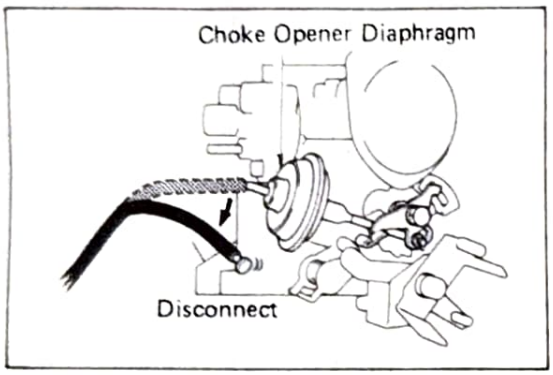


6. ADJUST FAST IDLE SPEED (15,000 miles; 24,000 km only*)

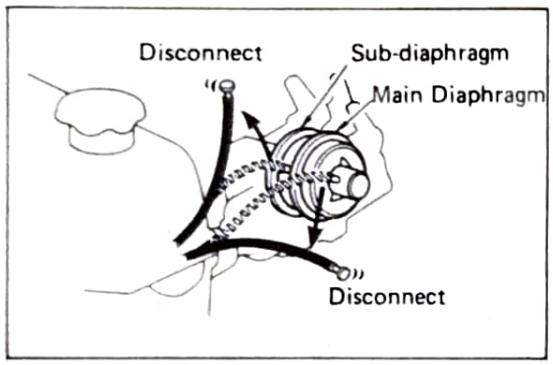
(a) Stop the engine and remove the air cleaner.

(b) Plug the hose connections for HAI system and MC system (RN C&C and Calif. RN w/ M/T) prevent rough idling.

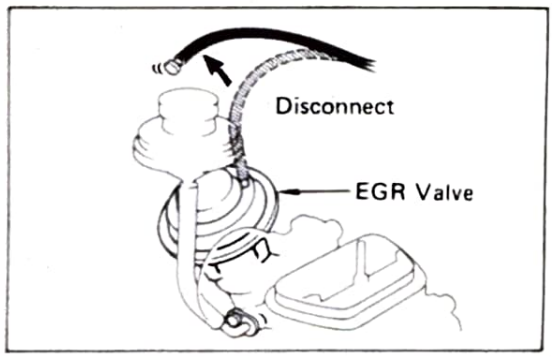
* The items marked with an asterisk are recommended maintenance items for California vehicles only, but are required maintenance items for Federal and Canada.



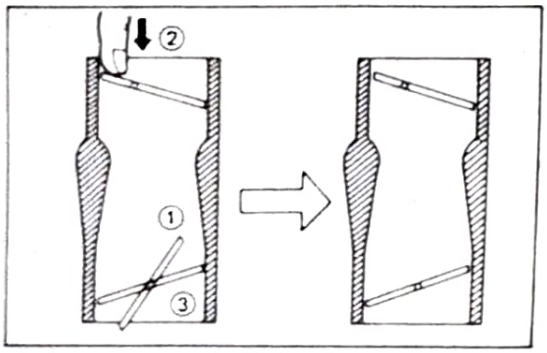
(c) Disconnect the hose from the choke opener diaphragm and plug the hose end.
This will shut off the choke opener system.



(d) Disconnect the hoses from the distributor sub-diaphragm and main diaphragm and plug the hose ends.
This will cut the vacuum advancer.

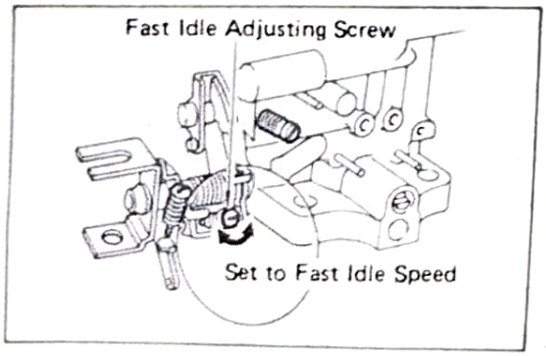


(e) (except Canada RN 4x4):
Disconnect the hose from the EGR valve.
This will shut off the EGR system.



(f) Set the fast idle cam.
While holding the throttle valve slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

(g) Start the engine, but do NOT touch the accelerator pedal.



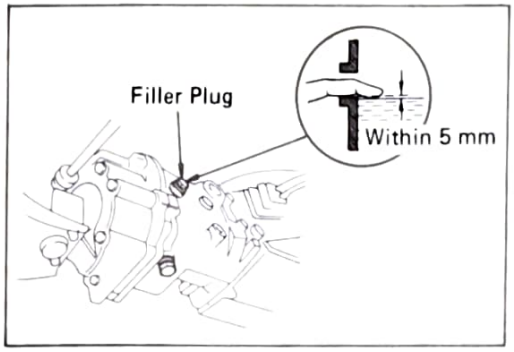
(h) Set the fast idle speed by turning the fast idle adjusting screw.

Fast idle speed: 2,600 rpm

(i) Reconnect the vacuum hoses to the proper locations.

(j) Reinstall the air cleaner.

(k) Remove the tachometer.



TRANSMISSION

7. CHECK OIL LEVEL IN TRANSMISSION, TRANSFER (RN 4x4 ONLY) AND DIFFERENTIAL

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transmission oil–

Oil grade: API GL-4 or GL-5

Viscosity:

RN 4x2	W50	SAE 75W-90 or 80W-90
	L48, L52	SAE 80W-90
RN 4x4	L45, L52	SAE 80W-90

Transfer oil–

Oil grade: API GL-4 or GL-5

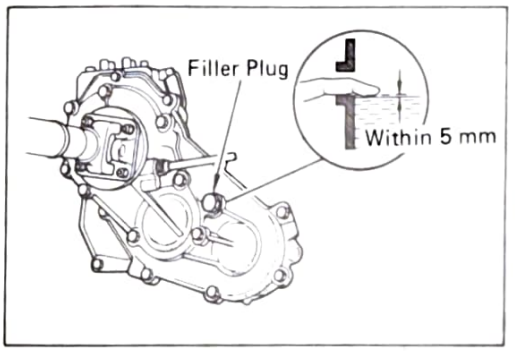
Viscosity: SAE 80W-90

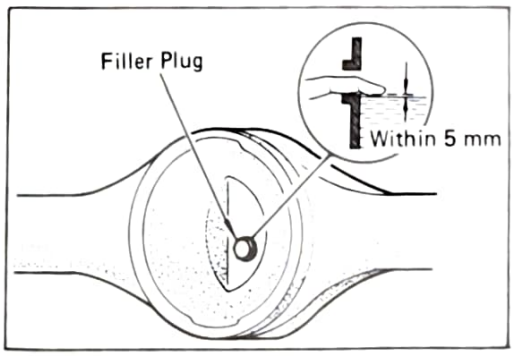
Differential oil–

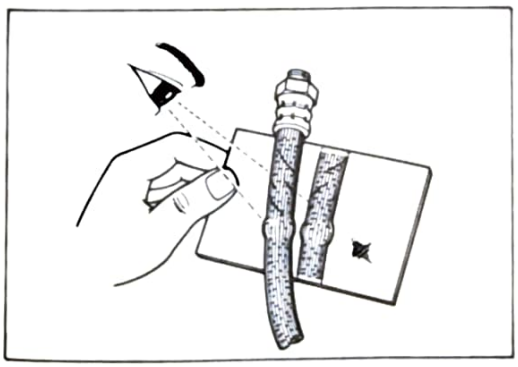
Oil grade: API GL-5 hypoid gear oil

Viscosity:

Above	–18° C (0° F)	SAE 90
Below	–18° C (0° F)	SAE 80W-90 or 80W







BRAKES

8. INSPECT BRAKE LINE PIPES AND HOSES

NOTE: Inspect in a well lighted area. Inspect entire circumference and length of brake hoses using a mirror as required. Turn front wheels fully right or left before inspecting the front brake.

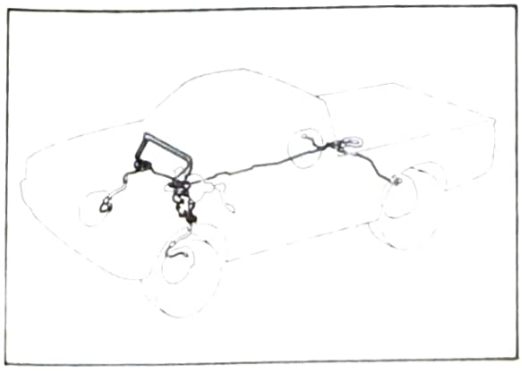
(a) Check all brake lines and hoses for:

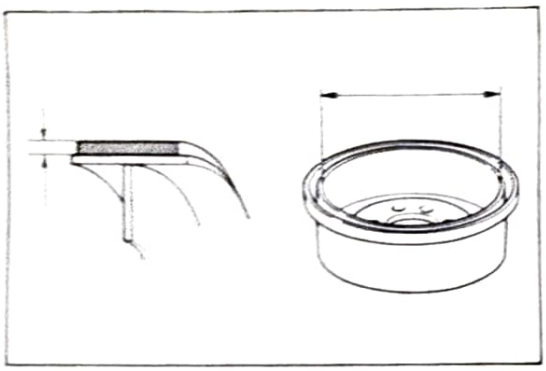
- Damage
- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage.

(c) Check that hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that lines installed in grommets pass through the center of the grommets.





9. INSPECT REAR BRAKE LININGS AND DRUMS

(a) Check the linings for wear.

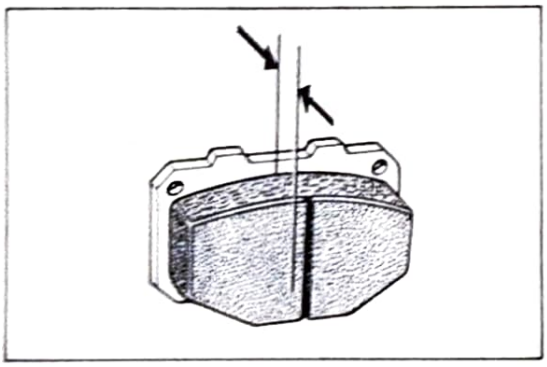
Minimum lining thickness: 1 mm (0.04 in.)

(b) Check the brake drums for scoring or wear.

Maximum drum inside diameter: 256.0 mm (10.079 in.)

(c) Clean brake parts with a damp cloth.

NOTE: Do not use compressed air to clean brake parts.



10. INSPECT FRONT BRAKE PADS AND DISCS

(a) Check the thickness of the disc brake pads and for irregular wear.

Minimum pad thickness: 1 mm (0.04 in.)

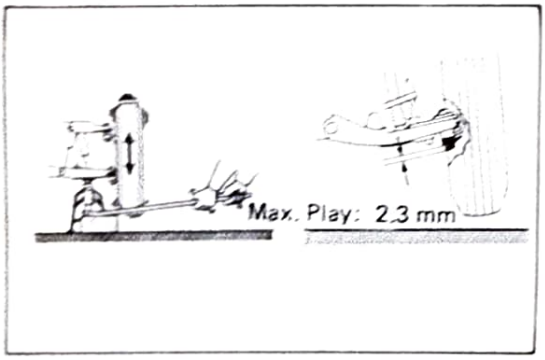
(b) Check the disc for wear or runout.

Minimum disc thickness:

RN C&C 19.0 mm (0.748 in.)
Others 11.5 mm (0.453 in.)

Maximum disc runout: 0.15 mm (0.0059 in.)

CHASSIS



11. RN 4x2 ONLY: INSPECT BALL JOINTS AND DUST COVERS

(a) Inspect the ball joints for excessive looseness.

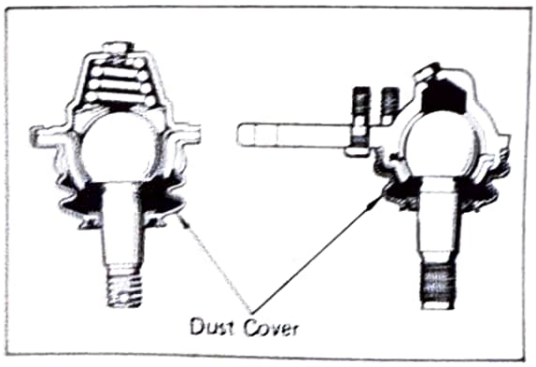
- Jack up the lower arm until the tire is off the ground.
- Move the tire up and down and check that there is no excessive play.

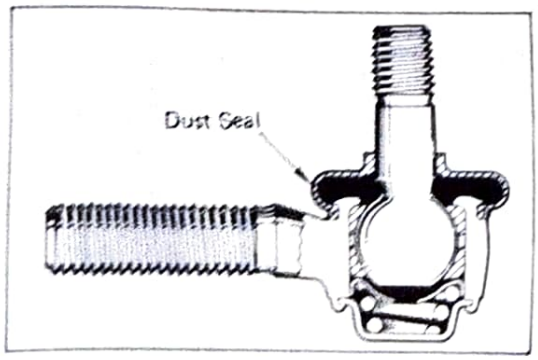
NOTE: This inspection should be performed with the brake pedal depressed to prevent occurrence of wheel bearing play.

Maximum ball joint vertical play: 2.3 mm (0.091 in.)

If excessive play is found, replace the ball joints.

(b) Inspect the dust cover for damage.



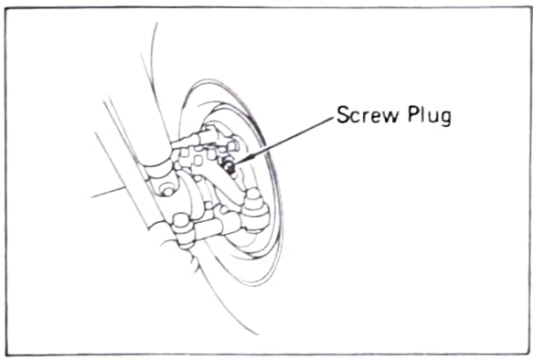


12. INSPECT STEERING LINKAGE AND GEAR BOX

(a) Check the steering linkage for looseness or damage. Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.

(b) Check the steering gear box for oil leaks.



13. RN 4x4 ONLY:
LUBE STEERING KNUCKLE AND CHASSIS
(Including propeller shaft)

(a) Remove the screw plug from each steering knuckle and repack with lubricant.

Steering knuckle grease: Molybdenum disulfide lithium base grease (NLGI No. 2)

(b) Reinstall the two screw plugs.

(c) Lubricate chassis components, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

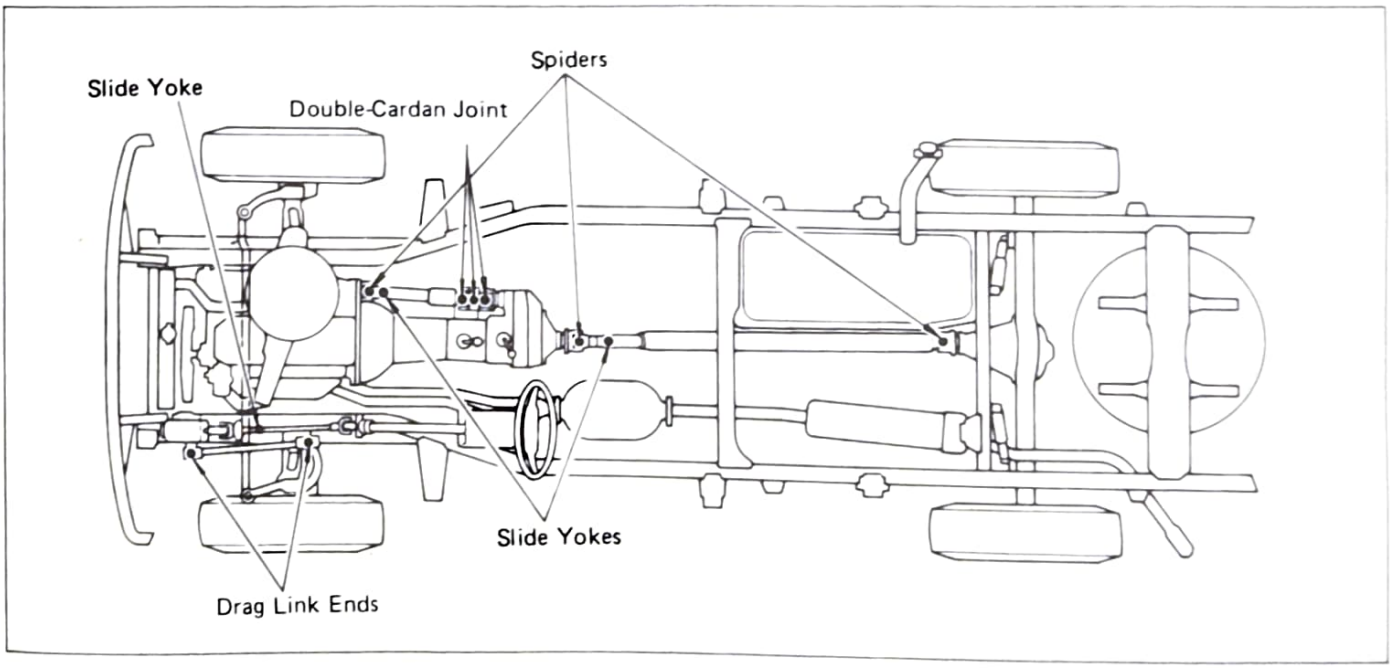
NOTE: To lubricate the propeller shaft spiders, use the grease charger attachment in the tool bag.

Grease grade:

Propeller shaft (except double-cardan joint)–
Lithium base chassis lubricant (NLGI No. 2)

Double-cardan joint–Molybdenum disulphide lithium base chassis lubricant (NLGI No. 2)

Drag link ends and steering intermediate shaft slide yoke – Lithium base chassis lubricant (NLGI No. 0)



14. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

- Seats mount bolts and nuts
- Front suspension member-to-frame mount bolts and nuts (RN 4x2)
- Strut bar bracket-to-frame mount bolts (RN 4x2)
- Leaf spring U-bolt mount nuts

15. FINAL INSPECTION

(a) Check operation of body parts:

- Hood
  Auxiliary catch operates properly
  Hood locks securely when closed
- Doors
  Door locks operate properly
  Doors close properly
- Seats
  Seats adjust easily and lock securely in any po
  tions
  Seat backs lock securely at any angle
  Folding-down seat backs lock securely

(b) Road test

- Engine and chassis parts do not have abnorma
  noises.
- Vehicle does not wander or pull to one side.
- Brakes work properly and do not drag.

(c) Be sure to deliver a clean vehicle and especia
check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

MAJOR MAINTENANCE AT	30	60	× 1,000 MILES
	48	96	× 1,000 KM
	24	48	MONTHS

MAJOR MAINTENANCE

Order	Maintenance items	Specifications	Page
	ENGINE		
	(Cold Engine Operations)		
1	Replace drive belts (30*/60,000 miles; 48*/96,000 km)	Drive belt tension: New belt 125±25 lb (w/ Borroughs drive belt tension gauge)	2-18
2	California vehicles only: Adjust tension of drive belts (30,000 miles; 48,000 km only)	Drive belt tension: Used belt 80±20 lb (w/ Borroughs drive belt tension gauge)	2-18
3	Replace spark plugs	Gap: 0.8 mm (0.031 in.)	2-18
4	Inspect ignition wiring (30/60,000 miles; 48/96,000 km) – ex. Calif. (60,000 miles; 96,000 km only) – for Calif.		2-19
5	Inspect cooling and heating systems, hoses and connections (60,000 miles; 96,000 km only)		2-19
6	Replace engine oil and oil filter	Engine oil capacity (Drain and refill with oil filter change): 4.6 liters (4.9 US qts, 4.0 Imp. qts)	2-19
7	Replace engine coolant	Coolant capacity (w/ heater or air conditioner): 8.4 liters (8.9 US qts, 7.4 Imp. qts)	2-20
8	Inspect PCV system (30/60,000 miles; 48/96,000 km) – ex. Calif. (60,000 miles; 96,000 km only) – for Calif.		2-20
9	Replace PCV valve (30/60,000 miles; 48/96,000 km) – ex. Calif. (60,000 miles; 96,000 km only) – for Calif.		2-20
10	Replace fuel filter (60,000 miles; 96,000 km only)		2-20
11	Replace gasket in fuel filler cap (60,000 miles; 96,000 km only)		2-20

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MAJOR MAINTENANCE AT	30 · 60	x 1,000 MILES
	48 · 96	x 1,000 KM
	24 · 48	MONTHS

Order	Maintenance items	Specifications	Page
12	Inspect fuel filler cap (30*/60,000 miles: 48*/96,000 km)		2-21
13	Inspect charcoal canister (30*/60,000 miles; 48*/96,000 km)		2-21
14	Inspect fuel evaporative emission control (EVAP) system hoses and connections (30*/60,000 miles, 48*/96,000 km)		2-22
15	Inspect fuel lines and connections		2-22
16	Inspect exhaust pipes and mountings		2-22
17	Inspect choke system		2-23
18	Replace air filter		2-23
	(Hot Engine Operations)		
19	Adjust valve clearance	Valve clearance: Intake 0.20 mm (0.008 in.) Exhaust 0.30 mm (0.012 in.)	2-23
20	Adjust idle speed (30*/60,000 miles; 48*/96,000 km)	Idle speed: 700 rpm M/T 750 rpm A/T	2-24
21	Adjust fast idle speed (30*/60,000 miles; 48*/96,000 km)	Fast idle speed (w/ EGR system OFF, vacuum advancer OFF and choke opener OFF): 2,600 rpm	2-25
	TRANSMISSION		
22	Check oil level in transmission, transfer (RN 4x4 only) and differential		2-26
	BRAKES		
23	Inspect brake line pipes and hoses		2-27
24	Inspect rear brake lining and drums	Minimum lining thickness: 1 mm (0.04 in.) Maximum drum inside diameter: 256.0 mm (10.079 in.)	2-27

* The items marked with an asterisk are recommended maintenance items for California vehicles only, but are required maintenance items for Federal and Canada.

MAJOR MAINTENANCE AT	30 · 60	x 1,000 MILES
	48 · 96	x 1,000 KM
	24 · 48	MONTHS

Order	Maintenance items	Specifications	Page
25	Inspect front brake pads and discs	Minimum pad thickness: 1 mm (0.04 in.) Minimum disc thickness: RN C&C 19.0 mm (0.748 in.) Others 11.5 mm (0.453 in.) Maximum disc runout: 0.15 mm (0.0059 in.)	2-27
	CHASSIS		
26	RN 4x2 only: Inspect ball joints and dust covers	Maximum ball joint vertical play: 2.3 mm (0.091 in.)	2-28
27	RN 4x2 only: Repack front wheel bearings and lube ball joints	Wheel bearing friction preload (at starting): 0.6 – 1.8 kg (1.3 – 4.0 lb)	2-28
28	RN 4x4 only: Repack front wheel bearings	Wheel bearing friction preload (at starting): 2.8 – 5.7 kg (6.2 – 12.6 lb)	2-29
29	Inspect steering linkage and gear box		2-30
30	RN 4x4 only: Lube steering knuckle and chassis (Including propeller shaft)		2-31
31	Tighten bolts and nuts on chassis and body		2-31
32	Final inspection		2-32

ENGINE

Cold Engine Operations

1. **REPLACE DRIVE BELTS**
(30*/60,000 miles; 48*/96,000 km)

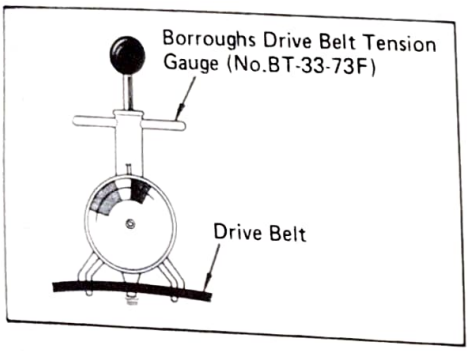
(a) Remove the old belts.

(b) Install new belts one by one and adjust each to the specified tension.

CAUTION: Do not pry on the die-cast body of the air pump.

NOTE: To check the drive belt tension, use a Borroughs Drive Belt Tension Gauge (No. BT-33-73F).

Drive belt tension: New belt 125 ± 25 lb

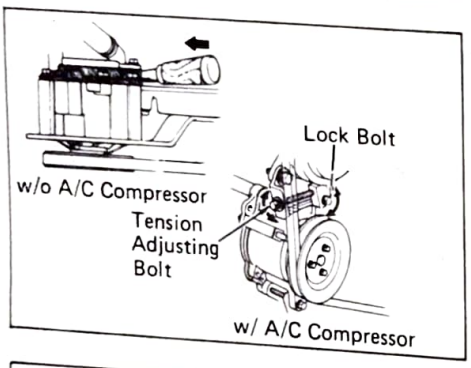


2. **CALIFORNIA VEHICLES ONLY: ADJUST TENSION OF DRIVE BELTS**
(30,000 miles; 48,000 km only)

Using a Borroughs Drive Belt Tension Gauge (No. BT-33-73F), check and adjust each belt to the specified tension.

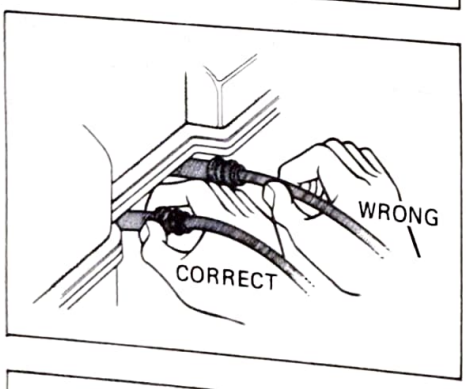
Drive belt tension: Used belt 80 ± 20 lb

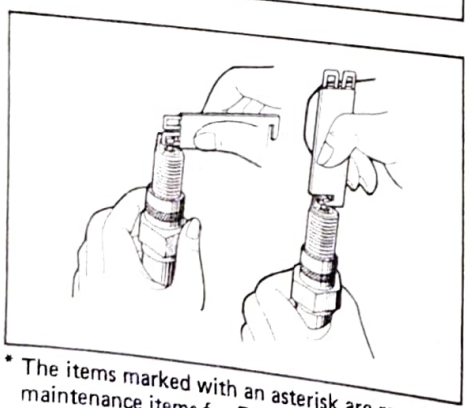
CAUTION: Do not pry on the die-cast body of the air pump.



3. **REPLACE SPARK PLUGS**

(a) Disconnect spark plug wires at boot. DO NOT pull on the wires. Remove the spark plugs.



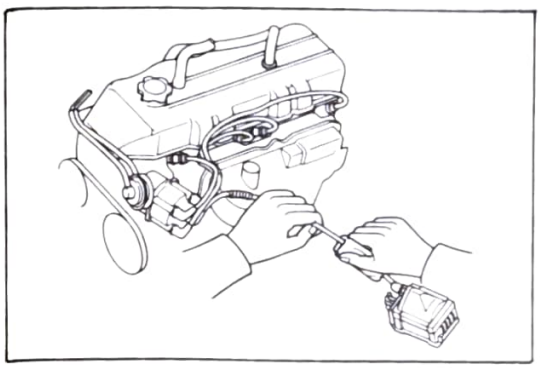


(b) Set the gap on the new plugs.

Gap: 0.8 mm (0.031 in.)

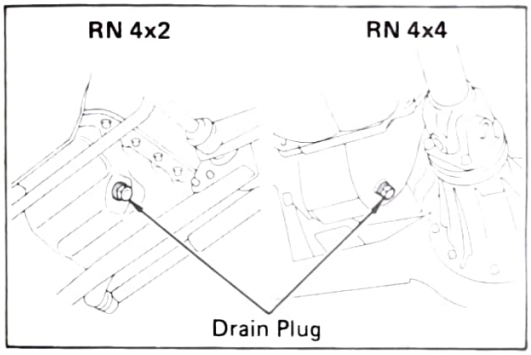
Recommended spark plugs:
ND W16EXR-U
NGK BPR5EY or BPR5EA-L

* The items marked with an asterisk are recommended maintenance items for California vehicles only, but are required maintenance items for Federal and Canada.

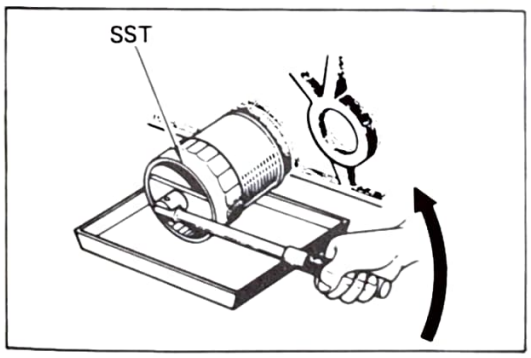


4. **INSPECT IGNITION WIRING**
(30/60,000 miles; 48/96,000 km) – ex. Calif.
(60,000 miles; 96,000 km only) – for Calif.
(a) Clean the wires with a clean cloth.
(b) Visually inspect the wiring for cracks, damage or burned terminals.

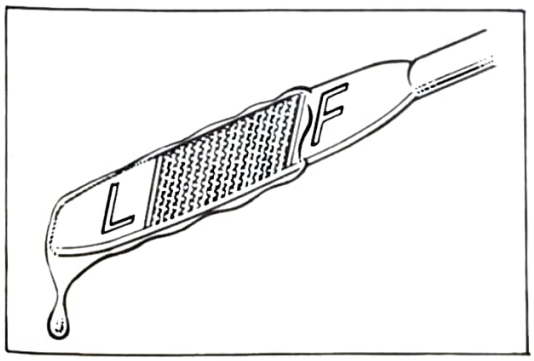
5. **INSPECT COOLING AND HEATING SYSTEMS, HOSES AND CONNECTIONS**
(60,000 miles; 96,000 km only)
(a) Visually check for coolant leakage.
(b) Check for hose rot or loose clamps.
Squeeze hoses to check for internal deterioration. If soft, replace.



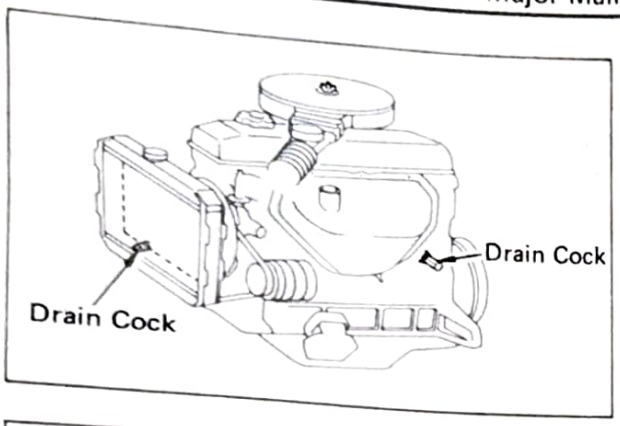
6. **REPLACE ENGINE OIL AND OIL FILTER**
(a) Remove the oil drain plug and drain the oil.



(b) Using SST, remove the oil filter (located on the engine block below the carburetor).
SST 09228-44010
(c) Install a new oil filter.
- Put a light coat of engine oil on the gasket.
- Hand tighten ONLY. DO NOT use a wrench to tighten the filter.



(d) Clean and install the oil drain plug with gasket.
(e) Fill the engine with new oil, API grade SE or better.
Engine oil capacity (Drain and refill with oil filter change): 4.6 liters (4.9 US qts, 4.0 Imp. qts)



7. REPLACE ENGINE COOLANT

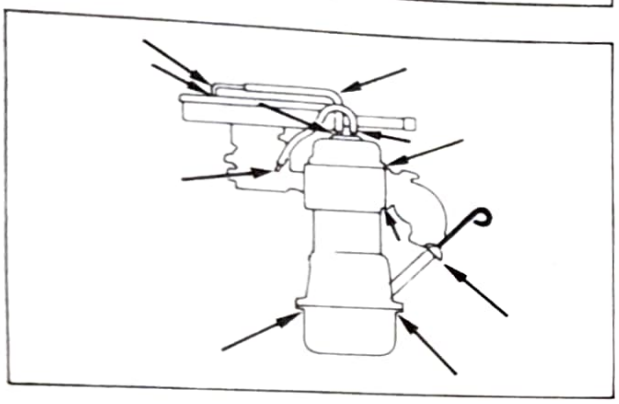
(a) Drain the coolant from the radiator and engine drain cocks. (Engine drain is at left rear of engine block.)

(b) Close the drain cocks.

(c) Fill system with coolant.

Coolant capacity (w/ heater or air conditioner):
8.4 liters (8.9 US qts, 7.4 Imp. qts)

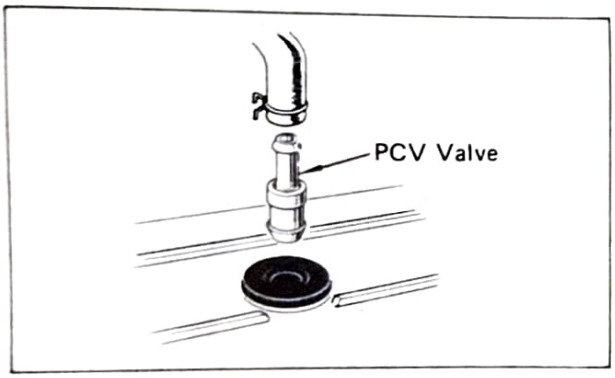
Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturers instruction.



8. INSPECT PCV SYSTEM

(30/60,000 miles; 48/96,000 km) – ex. Calif.
(60,000 miles; 96,000 km only) – for Calif.

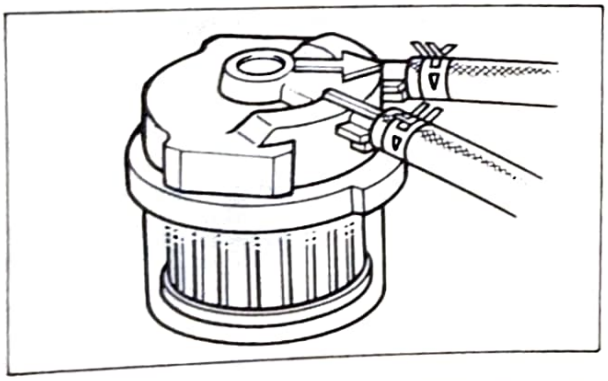
Visually inspect hoses, connections and gaskets for cracks, leaks or damage.



9. REPLACE PCV VALVE

(30/60,000 miles; 48/96,000 km) – ex. Calif.
(60,000 miles; 96,000 km only) – for Calif.

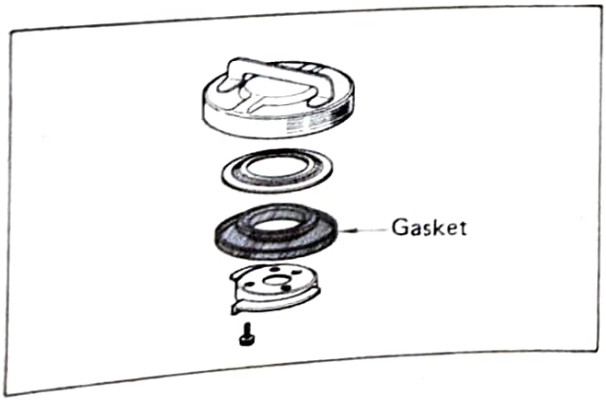
Be sure to install the valve with large end down to ensure correct air flow.



10. REPLACE FUEL FILTER

(60,000 miles; 96,000 km only)

Be sure to install filter in proper direction for fuel flow. Fuel filter is located near the fuel tank.

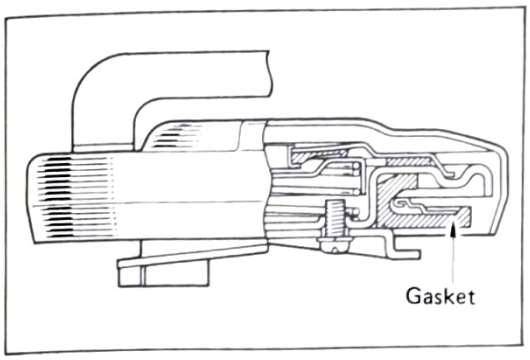


11. REPLACE GASKET IN FUEL FILLER CAP

(60,000 miles; 96,000 km only)

(a) Remove the four screws and locking plate. Pull out the old gasket.

(b) Install the new gasket by hand. Install the locking plate with four screws.



12. INSPECT FUEL FILLER CAP (30*/60,000 miles; 48*/96,000 km)

Check the gasket for deformation or damage.

13. INSPECT CHARCOAL CANISTER (30*/60,000 miles; 48*/96,000 km)

A. RN 4x2 (except C&C):

(a) Disconnect the hoses to the charcoal canister located below the fuel filter. Label hoses for correct installation.

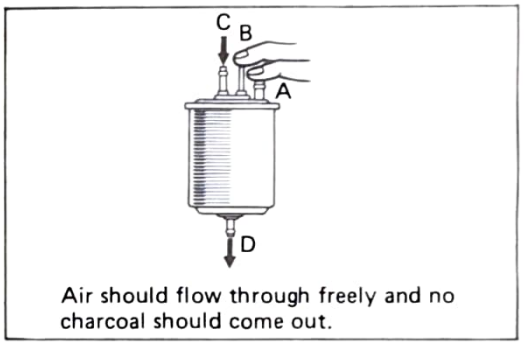
(b) Plug pipes A and B with your fingers and blow compressed air (3 kg/cm² or 43 psi) through pipe C (fuel tank side).

- Check that air comes out of the bottom pipe D without resistance.
- Check that no activated charcoal comes out.

If necessary, replace the charcoal canister.

NOTE: Do not attempt to wash the charcoal.

(c) Connect the hoses to the charcoal canister.



Air should flow through freely and no charcoal should come out.

B. RN C&C and RN 4x4 (ex. Canada RN 4x4):

(a) Inspect the fuel tank and carburetor charcoal canisters.

(b) Disconnect the hoses to the fuel tank charcoal canister located below the fuel filter. Label hoses for correct installation.

(c) Plug pipe A with your finger and blow compressed air (3 kg/cm² or 43 psi) through pipe B (fuel tank side).

- Check that air comes out of the bottom pipe C without resistance.
- Check that no activated charcoal comes out.

If necessary, replace the charcoal canister.

NOTE: Do not attempt to wash the charcoal.

(d) Connect the hoses to the charcoal canister.

For Fuel Tank

Air should flow through freely and no charcoal should come out.

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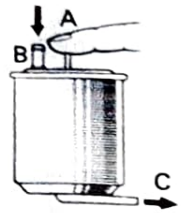
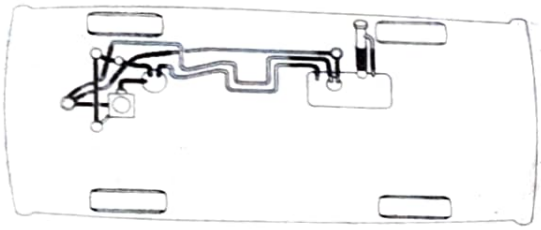
For Carburetor

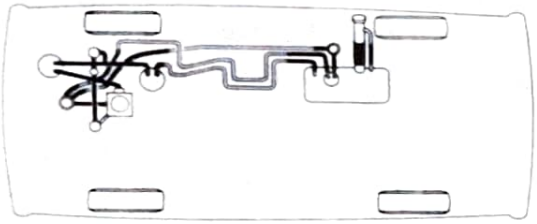


Air should flow through freely and no charcoal should come out.

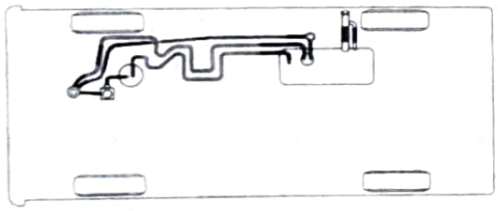
RN 4x2 (ex. C&C)



RN C&C and RN 4x4 (ex. Canada 4x4)



Canada RN 4x4



(e) Disconnect the hoses to the carburetor charcoal canister located below the battery. Label hoses for correct installation.

(f) Plug pipe A with your finger and blow compressed air (3 kg/cm² or 43 psi) through pipe B (Outer vent control valve side).

- Check that air comes out of the bottom pipe C without resistance.
- Check that no activated charcoal comes out.

If necessary, replace the charcoal canister.

NOTE: Do not attempt to wash the charcoal.

(g) Connect the hoses to the charcoal canister.

14. INSPECT FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM HOSES AND CONNECTIONS (30*/60,000 miles; 48*/96,000 km)

(a) Visually inspect lines and connections for loose connections, sharp bends or damage.

(b) Visually inspect the fuel tank for deformation, cracks or fuel leakage.

(c) Visually inspect the filler neck for damage or fuel leakage.

15. INSPECT FUEL LINES AND CONNECTIONS

Visually inspect fuel lines for cracks, leakage or loose connections.

16. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect pipes, hangers, and connections for severe corrosion, leaks or damage.

* The items marked with an asterisk are recommended maintenance items for California vehicles only, but are required maintenance items for Federal and Canada.

17. INSPECT CHOKE SYSTEM

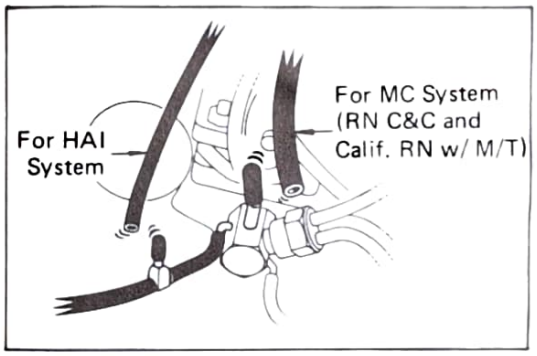
(a) Remove the air cleaner.

(b) Clean the choke shaft and linkage.

- Spray carburetor (or choke) cleaner on the choke linkage to remove dirt and dust.
- Spray carburetor (or choke) cleaner on both ends of the choke shaft while opening and closing the choke valve by hand.

18. REPLACE AIR FILTER

Replace the used air cleaner element with a new one.



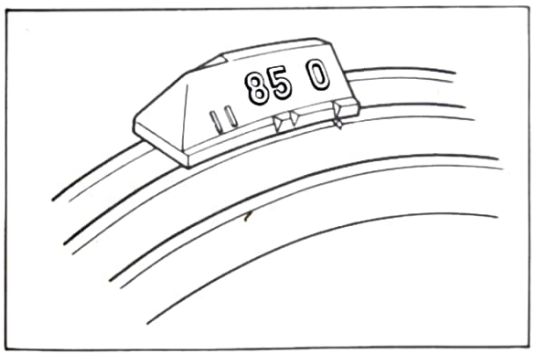
Hot Engine Operations

19. ADJUST VALVE CLEARANCE

NOTE: Before starting the engine, plug the hose connections for the HAI and MC systems (RN C&C and Calif. RN w/M/T) to prevent rough idling.

(a) Warm up the engine to normal operating temperature.

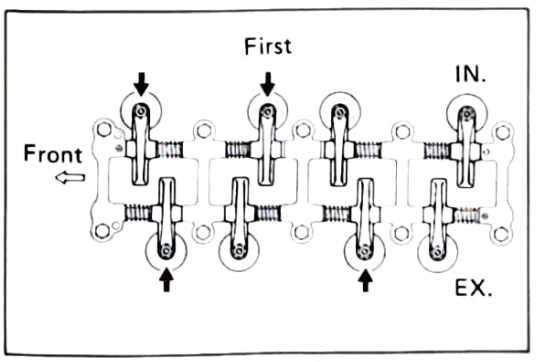
(b) Stop the engine and remove the valve cover.



(c) Set No.1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the 0 position.
- Check that the rocker arms on No.1 cylinder are loose and rockers on No.4 are tight.

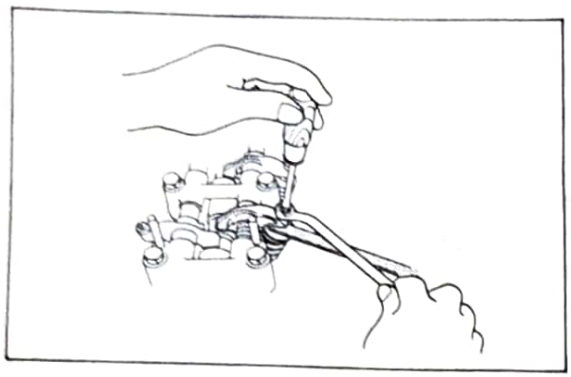
If not, turn the crankshaft one complete revolution and align marks as above.



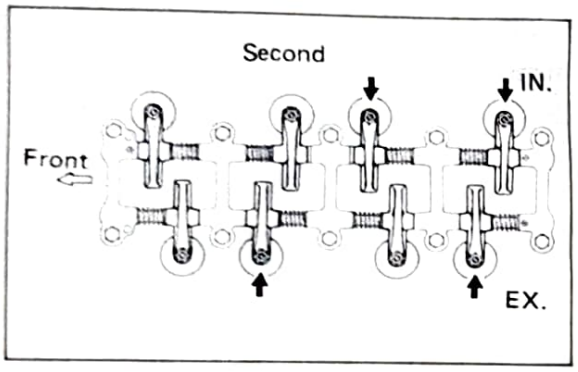
(d) Adjust the clearance of half of the valves.

- Adjust only those valves indicated by arrows.

Valve clearance: **Intake** **0.20 mm (0.008 in.)**
Exhaust **0.30 mm (0.012 in.)**



- Use a feeler gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position and tighten the lock nut.
- Recheck the clearance. The feeler gauge should move with a very slight drag.



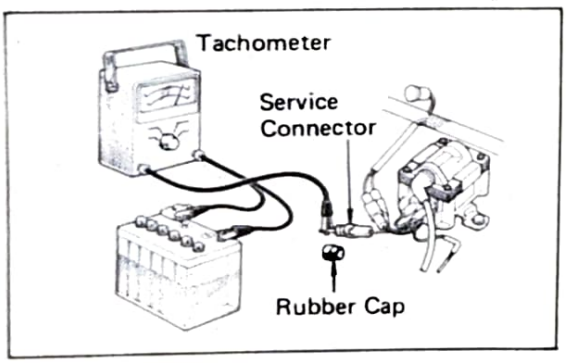
(e) Turn the crankshaft one revolution and adjust the other valves.
Turn the crankshaft 360° and align timing marks in the manner mentioned above. Adjust only the valves indicated by arrows.

(f) Reinstall the valve cover.

(g) Reinstall the air cleaner.

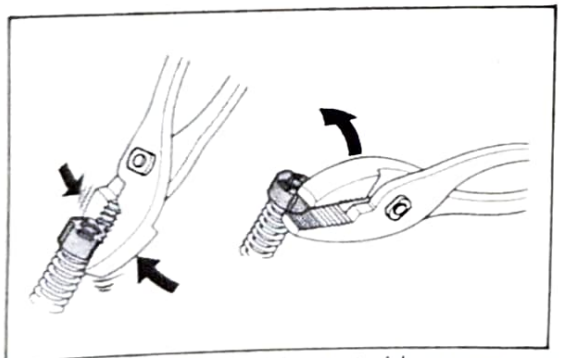
20. ADJUST IDLE SPEED
(30*/60,000 miles; 48*/96,000 km)

(a) Preparation
- Air cleaner installed
- Choke valve fully open
- Accessories switched off
- All vacuum lines connected (i.e., AI, EGR systems, etc.)
- Transmission in N range
- Engine idling at normal operating temperature



(b) Connect a tachometer to the engine.
Remove the rubber cap and connect the tachometer positive (+) terminal to the service connector from the igniter.

CAUTION:
1. **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
2. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**



(c) Using pliers, break off the idle limiter cap on the idle speed adjusting screw, if installed.

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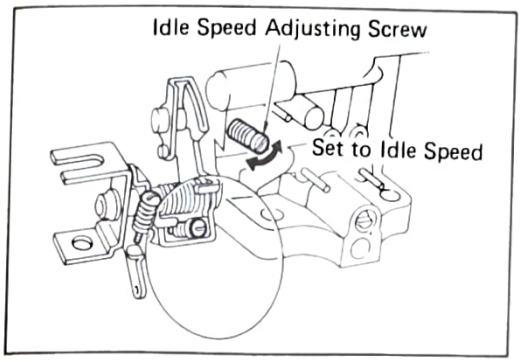
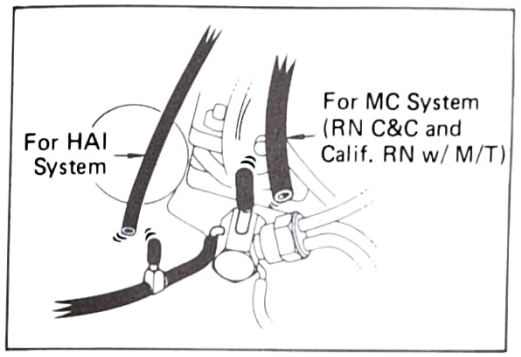


(d) Set the idle speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle speed: 700 rpm M/T
750 rpm A/T

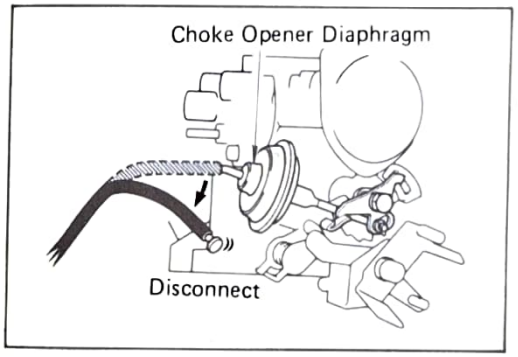
NOTE: Leave the tachometer connected for further adjustments.



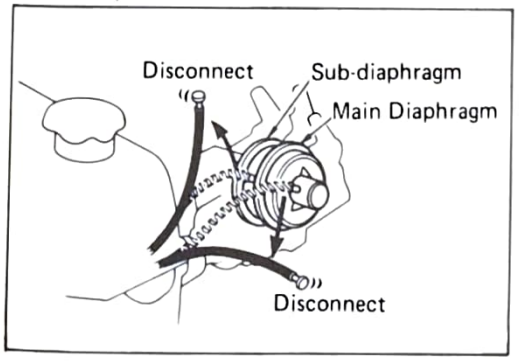
21. ADJUST FAST IDLE SPEED (30*/60,000 miles; 48*/96,000 km)

(a) Stop the engine and remove the air cleaner.

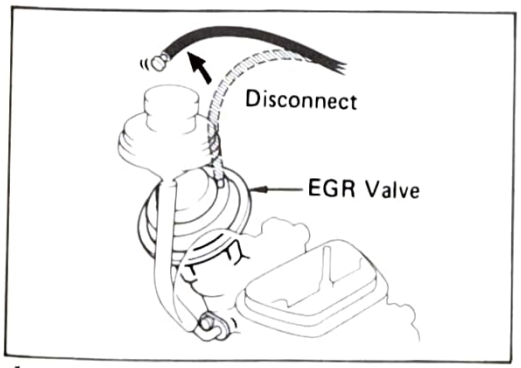
(b) Plug the hose connections for the HAI and MC systems (RN C&C and Calif. RN w/ M/T) to prevent rough idling.



(c) Disconnect the hose from the choke opener diaphragm and plug the hose end.
This will shut off the choke opener system.

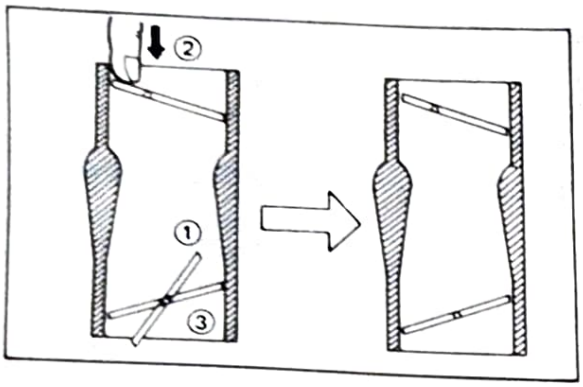


(d) Disconnect the hoses from the distributor sub-diaphragm and main diaphragm and plug the hose ends.
This will cut the vacuum advance.



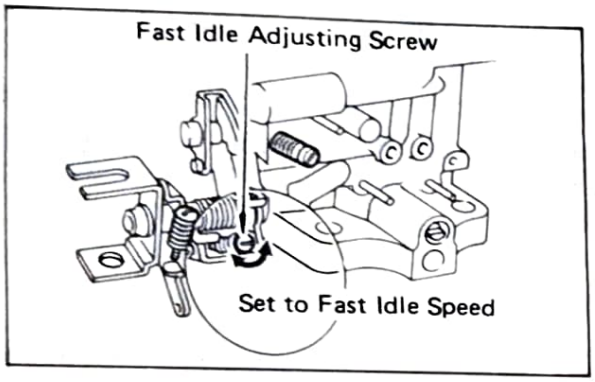
(e) (except Canada 4x4): Disconnect the hose from the EGR valve.
This will shut off the EGR system.

*The items marked with an asterisk are recommended maintenance items for California vehicles only, but are required maintenance items for Federal and Canada.



(f) Set the fast idle cam.
While holding the throttle valve slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

(g) Start the engine, but do NOT touch the accelerator pedal.



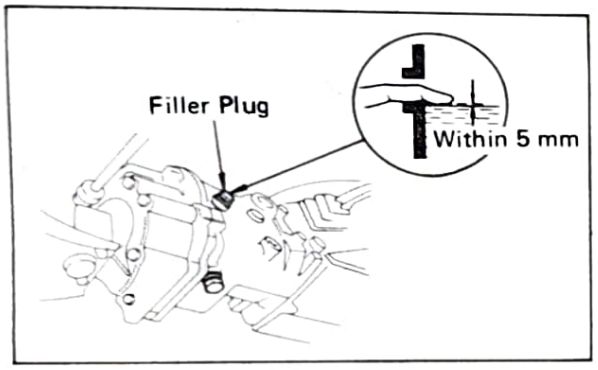
(h) Set the fast idle speed by turning the fast idle adjusting screw.

Fast idle speed: 2,600 rpm

(i) Reconnect the vacuum hoses to the proper locations.

(j) Reinstall the air cleaner.

(k) Remove the tachometer.



TRANSMISSION

22. CHECK OIL LEVEL IN TRANSMISSION, TRANSFER (RN 4x4 ONLY) AND DIFFERENTIAL

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transmission oil–

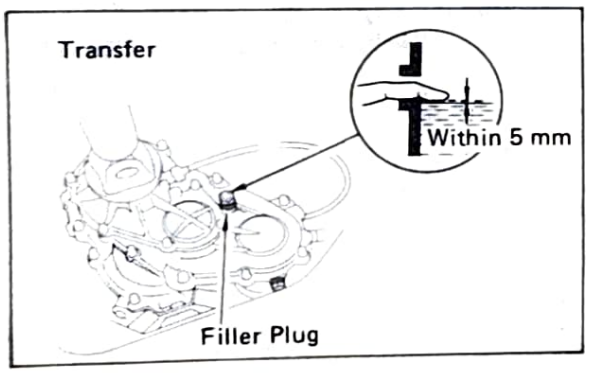
Oil grade:	**API GL-4 or GL-5**	
Viscosity:		
RN 4x2	**W50**	**SAE 75W-90 or 80W-90**
	L48, L52	**SAE 80W-90**
RN 4x4	**L45, L52**	**SAE 80W-90**

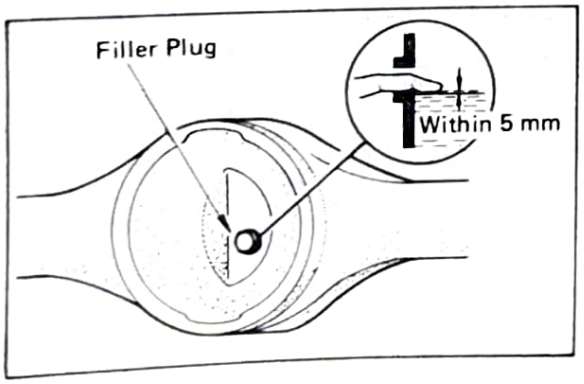
Transfer oil–

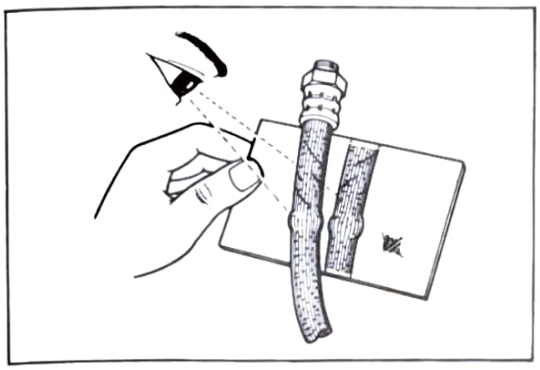
Oil grade:	**API GL-4 or GL-5**
Viscosity:	**SAE 80W-90**

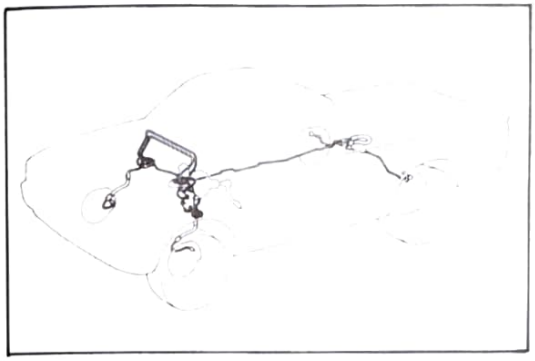
Differential oil–

Oil grade:	**API GL-5 hypoid gear oil**	
Viscosity:	**Above –18°C (0°F)**	**SAE 90**
	Below –18°C (0°F)	**SAE 80W-90 or 80W**









BRAKES

23. INSPECT BRAKE LINE PIPES AND HOSES

NOTE: Inspect in a well lighted area. Inspect entire circumference and length of brake hoses using a mirror as required. Turn front wheels fully right or left before inspecting the front brake.

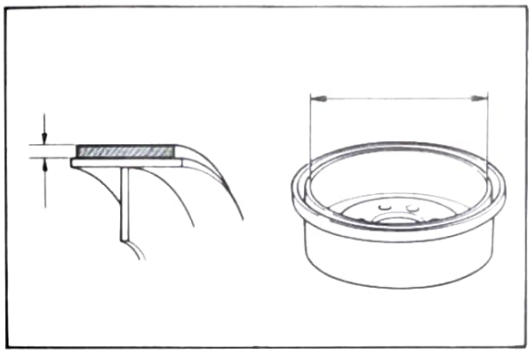
(a) Check all brake lines and hoses for:

- Damage
- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage.

(c) Check that hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that lines installed in grommets pass through the center of the grommets.



24. INSPECT REAR BRAKE LININGS AND DRUMS

(a) Check the linings for wear.

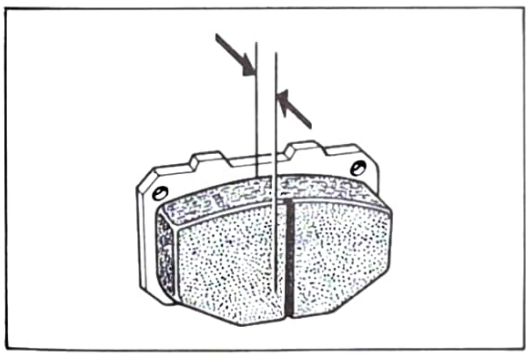
Minimum lining thickness: 1 mm (0.04 in.)

(b) Check the brake drums for scoring or wear.

Maximum drum inside diameter: 256.0 mm (10.079 in.)

(c) Clean brake parts with a damp cloth.

NOTE: Do not use compressed air to clean brake parts.



25. INSPECT FRONT BRAKE PADS AND DISCS

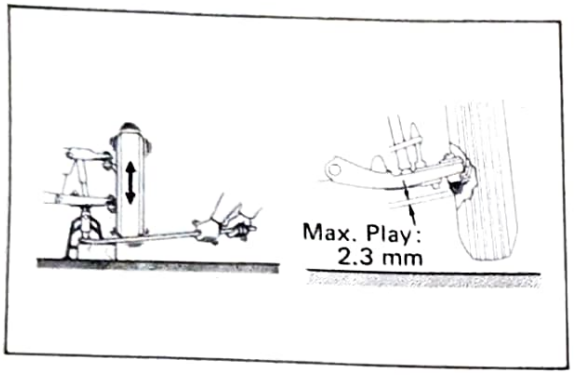
(a) Check the thickness of the disc brake pads and for irregular wear.

Minimum pad thickness: 1 mm (0.04 in.)

(b) Check the disc for wear or runout.

Minimum disc thickness:
RN C&C 19.0 mm (0.748 in.)
Others 11.5 mm (0.453 in.)

Maximum disc runout: 0.15 mm (0.0059 in.)



CHASSIS

26. RN 4x2 ONLY: INSPECT BALL JOINTS AND DUST COVERS

(a) Inspect the ball joints for excessive looseness.

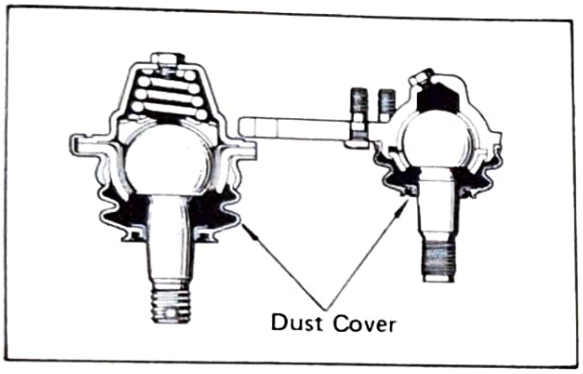
- Jack up the lower arm until the tire is off the ground.
- Move the tire up and down and check that there is no excessive play.

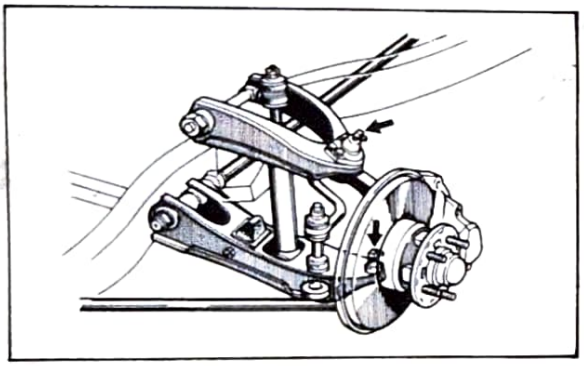
NOTE: This inspection should be performed with the brake pedal depressed to prevent occurrence of wheel bearing play.

Maximum ball joint vertical play: 2.3 mm (0.091 in.)

If excessive play is found, replace the ball joints.

(b) Inspect the dust cover for damage.



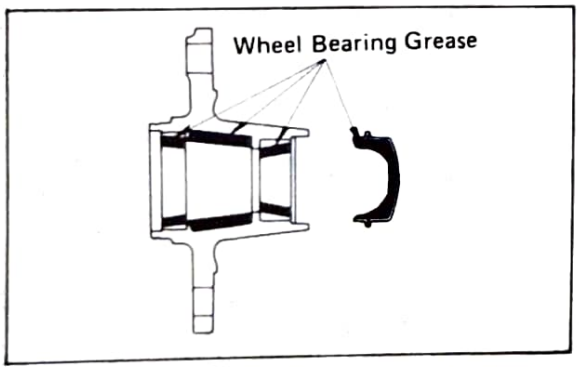


27. RN 4x2 ONLY: REPACK FRONT WHEEL BEARINGS AND LUBE BALL JOINTS

(a) Lubricate ball joints.

- Remove the ball joint screw plug, attach fitting and fill with grease.
- Check that the ball joints do not leak grease.

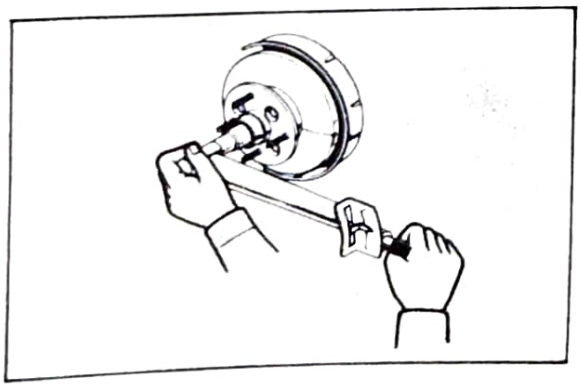
Grease grade: Molybdenum – disulphide lithium base chassis lubricant (NLGI No. 1 or 2)



(b) Change front wheel bearing grease.

- Remove the hubs and inner and outer bearings. Clean in solvent and inspect the bearings for damage.
- Pack the bearings and axle hubs with multi-purpose grease.

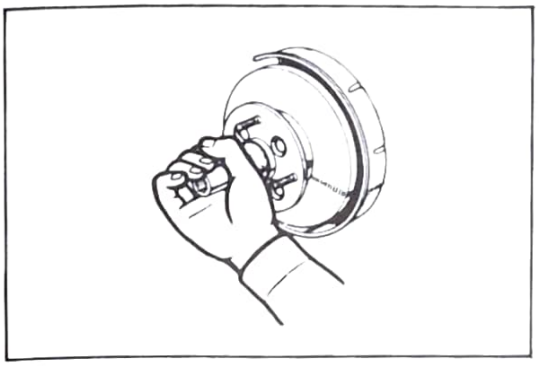
Grease grade: Multipurpose grease (NLGI No. 2)



(c) Install the hubs and adjust the wheel bearing pre-load.

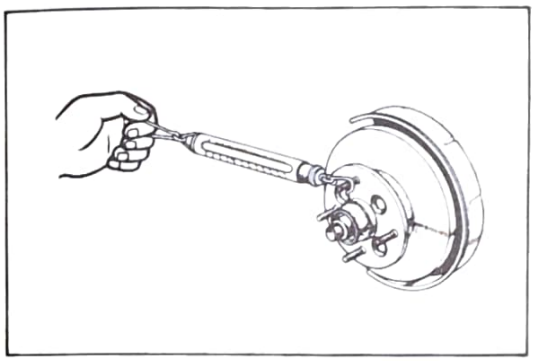
- Tighten the nut to specified torque and turn hub 2 to 3 times to allow bearings to seat properly.

Torque: Approx. 3 kg-m (22 ft-lb)



- Unscrew the nut enough to turn it by hand. Using a socket, tighten the nut as much as possible by hand.

NOTE: Do not use a socket wrench.

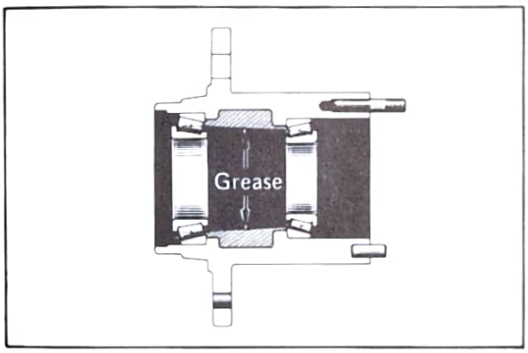


- Using a spring tension gauge, check for correct preload.

Wheel bearing friction preload (at starting):
0.6 – 1.8 kg (1.3 – 4.0 lb)

If the preload is incorrect, loosen or tighten the nut to correct the preload.

- Insure that the hub turns smoothly and there is no play in the bearing.

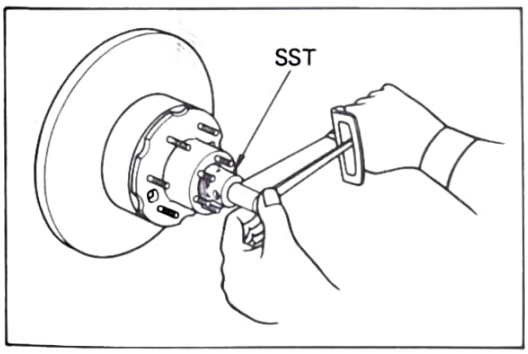


28. RN 4x4 ONLY:
REPACK FRONT WHEEL BEARINGS

(a) Change front wheel bearing grease.

- Remove the hubs and inner and outer bearings. Clean in solvent and inspect the bearings for damage.
- Pack the bearings and axle hubs with lithium base multipurpose grease.

Grease grade: Lithium base multipurpose grease (NLGI No. 2)

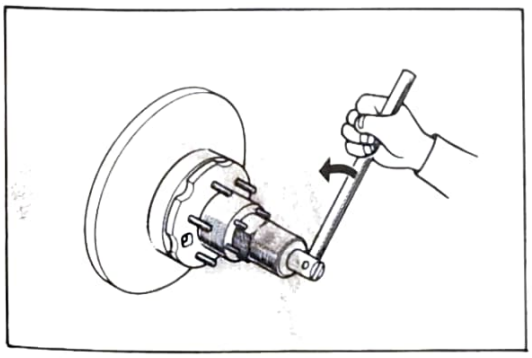


(b) Install the hubs and adjust the wheel bearing preload.

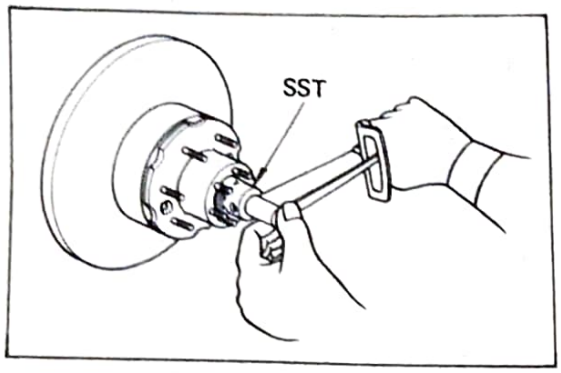
- Using SST, tighten the adjust nut and turn the hub right and left two or three times.

Torque: 6.0 kg-m (43 ft-lb)

SST 09607-60020



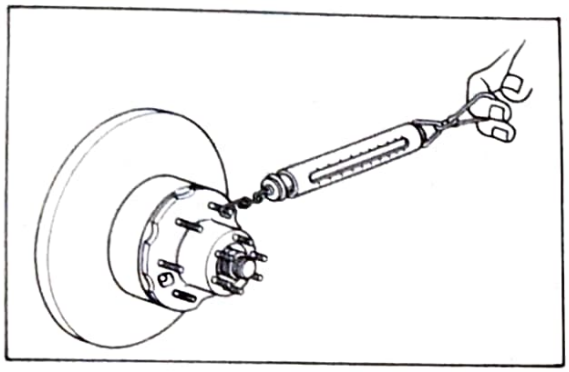
- Loosen the adjusting nut until it can be turned by hand.



- Retighten the adjusting nut.

Torque: 0.4 – 0.7 kg-m (35 – 60 in.-lb)

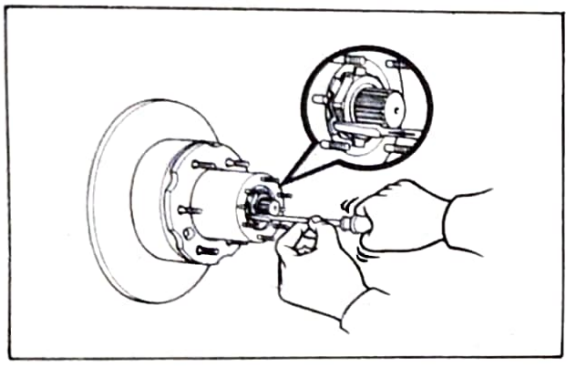
- Insure that the hub turns smoothly and there is no play in the bearing.



- Using a spring tension gauge, check for correct preload.

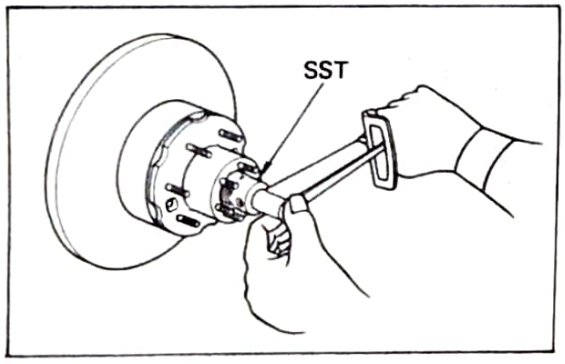
Wheel bearing friction preload (at starting):
2.8 – 5.7 kg (6.2 – 12.6 lb)

If the preload is incorrect, loosen or tighten the nut to correct the preload.



(c) Install the lock washer and lock nut.

(d) Lock the adjusting nut by bending one of the lock washer teeth inward.

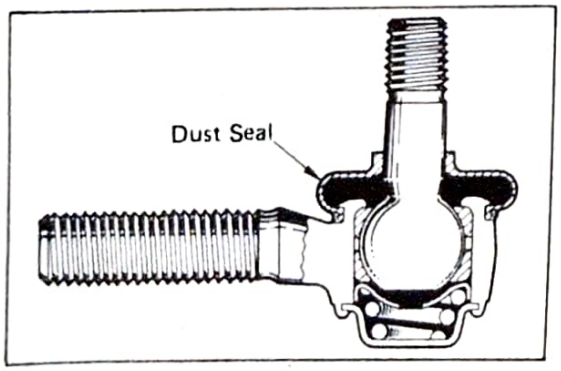


(e) Using SST, tighten the lock nut.

Torque: 8.0 – 10.0 kg-m (58 – 72 ft-lb)

SST 09607-60020

(f) Lock the lock nut by bending one of the lock washer teeth outward.

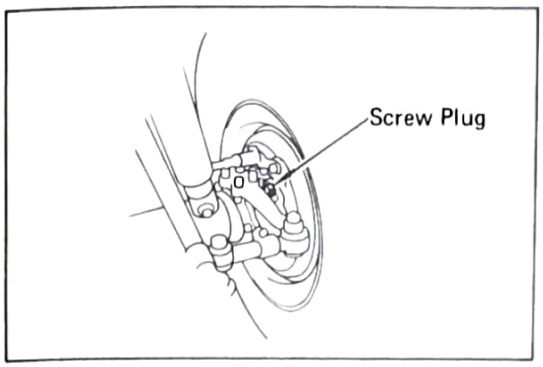


29. INSPECT STEERING LINKAGE AND GEAR BOX

(a) Check the steering linkage for looseness or damage. Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.

(b) Check the steering gear box for oil leaks.



30. RN 4x4 ONLY:
LUBE STEERING KNUCKLE AND CHASSIS
(Including propeller shaft)

(a) Remove the screw plug from each steering knuckle and repack with lubricant.

Steering knuckle grease – Molybdenum disulfide lithium base grease (NLGI No. 2)

(b) Reinstall the two screw plugs.

(c) Lubricate chassis components, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

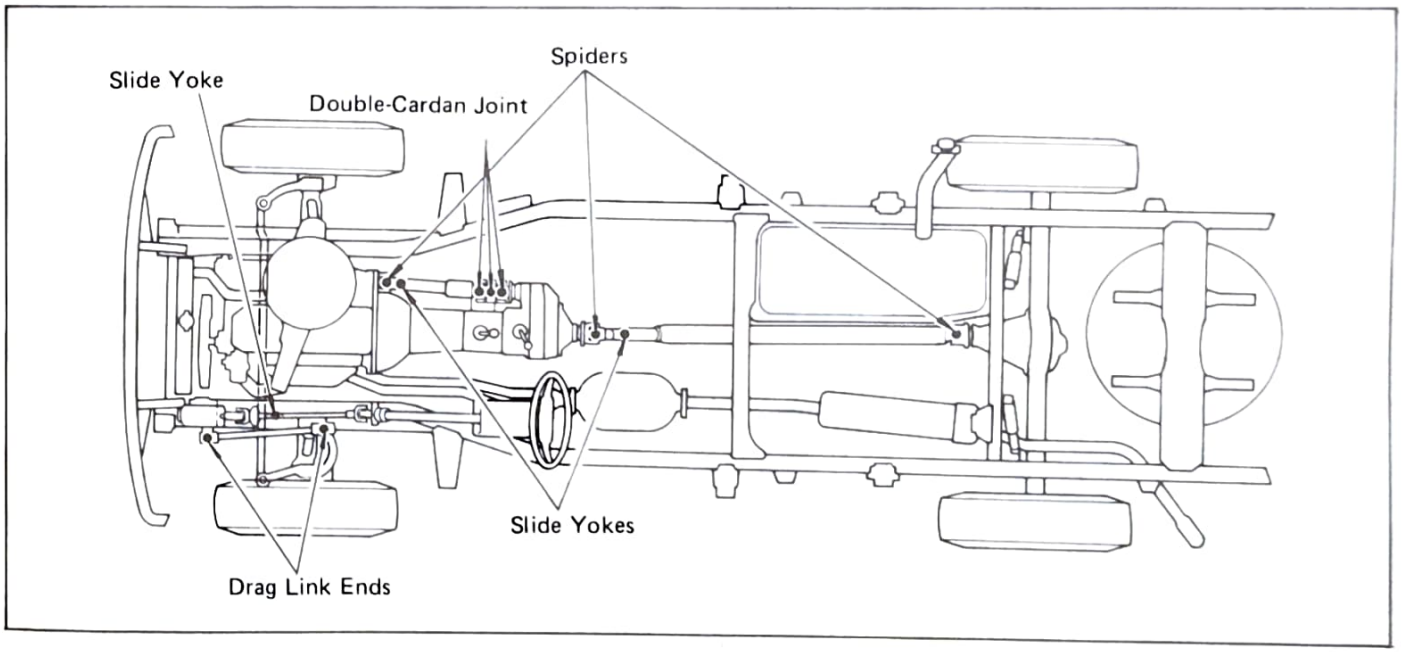
NOTE: To lubricate the propeller shaft spiders, use the grease charger attachment in the tool bag.

Grease grade:

Propeller shaft (except double-cardan joint) – Lithium base chassis lubricant (NLGI No. 2)

Double-cardan joint – Molybdenum disulphide lithium base chassis lubricant (NLGI No.2)

Drag link ends and steering intermediate shaft slide yoke – Lithium base chassis lubricant (NLGI No. 0)



31. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

- Seats mount bolts and nuts
- Front suspension member-to-frame mount bolts and nuts (RN 4x2)
- Strut bar bracket-to-frame mount bolts (RN 4x2)
- Leaf spring U-bolt mount nuts

32. FINAL INSPECTION

(a) Check operation of body parts:

- Hood
  Auxiliary catch operates properly
  Hood locks securely when closed
- Doors
  Doors locks operate properly
  Doors close properly
- Seats
  Seats adjust easily and lock securely in any position
  Seat backs lock securely at any angle
  Folding-down seat backs lock securely

(b) Road test

- Engine and chassis parts do not have abnormal noises.
- Vehicle does not wander or pull to one side.
- Brakes work properly and do not drag.

(c) Be sure to deliver a clean vehicle and especially check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

MAINTENANCE UNDER SEVERE CONDITIONS

For vehicles normally used under any of the following severe conditions, the applicable items of maintenance should be performed as indicated in the table below.

"Severe conditions"
- A–Pulling trailers
- B–Repeated short trips
- C–Driving on rough and/or muddy roads
- D–Driving on dusty roads
- E–Operating in extremely cold weather and/or driving in areas using road salt
- F–Repeated short trips in extremely cold weather

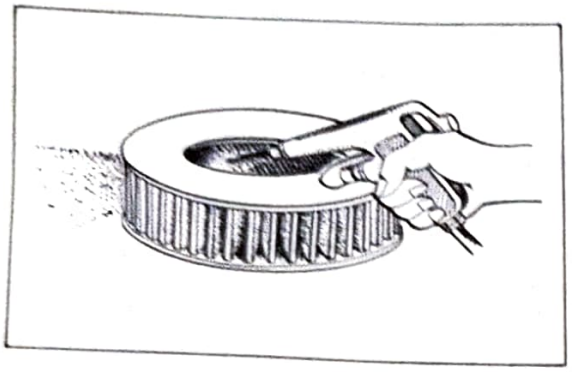
TRUCK (RN 4x2)

Severe condition	Maintenance items	Service interval		Page
A . . D . F	Engine oil and oil filter	R	Every 3,750 miles (6,000 km) or 3 months	2-19
A B C . E .	Exhaust pipes and mountings	I	Every 7,500 miles (12,000 km) or 6 months	2-22
. . . D . .	Air filter	I	Every 3,750 miles (6,000 km) or 3 months	2-34
		R	Every 30,000 miles (48,000 km) or 24 months	2-23
. . . . E .	Ignition wiring	I	Every 12 months	2-34
. . . . E .	Distributor cap	I	Every 12 months	2-34
A B C D . .	Brake linings and drums	I	Every 7,500 miles (12,000 km) or 6 months	2-27
A B C D . .	Brake pads and discs	I	Every 7,500 miles (12,000 km) or 6 months	2-27
. . C . . .	Steering linkage and gear box	I	Every 7,500 miles (12,000 km) or 6 months	2-30
. . C D E .	Ball joints and dust covers	I	Every 7,500 miles (12,000 km) or 6 months	2-28
A . C . . .	Transmission and differential oil	R	Every 15,000 miles (24,000 km) or 12 months	2-34
A . C . . .	Automatic transmission fluid	R	Every 15,000 miles (24,000 km) or 12 months	2-35
. . C . . .	Bolts and nuts on chassis and body	I	Initial 3,750 miles (6,000 km) or 3 months and every 7,500 miles (12,000 km) or 6 months	2-31 & 2-35

TRUCK 4WD (RN 4x4)

Severe condition	Maintenance items	Service interval		Page
A . . D . F	Engine oil and oil filter	R	Every 3,750 miles (6,000 km) or 3 months	2-19
A B C . E .	Exhaust pipes and mountings	I	Every 7,500 miles (12,000 km) or 6 months	2-22
. . . D . .	Air filter	I	Every 3,750 miles (6,000 km) or 3 months	2-34
		R	Every 30,000 miles (48,000 km) or 24 months	2-23
. . . . E .	Ignition wiring	I	Every 12 months	2-34
. . . . E .	Distributor cap	I	Every 12 months	2-34
A B C D . .	Brake linings and drums	I	Every 7,500 miles (12,000 km) or 6 months	2-27
A B C D . .	Brake pads and discs	I	Every 7,500 miles (12,000 km) or 6 months	2-27
. . C . . .	Steering linkage and gear box	I	Every 7,500 miles (12,000 km) or 6 months	2-30
A . C . . .	Transmission, transfer and differential oil	R	Every 15,000 miles (24,000 km) or 12 months	2-34
. . C . . .	Steering knuckle and chassis grease	R	Every 7,500 miles (12,000 km) or 6 months	2-31
A . C . . .(*)	Propeller shaft grease	R	Every 7,500 miles (12,000 km) or 6 months	2-31
. . C . . .	Bolts and nuts on chassis and body	I	Initial 3,750 miles (6,000 km) or 3 months and every 7,500 miles (12,000 km) or 6 months	2-31 & 2-35

(*): If the propeller shaft has been immersed in water, it should be re-greased within 24 hours (Double-cardan joint only).



INSPECT AIR FILTER

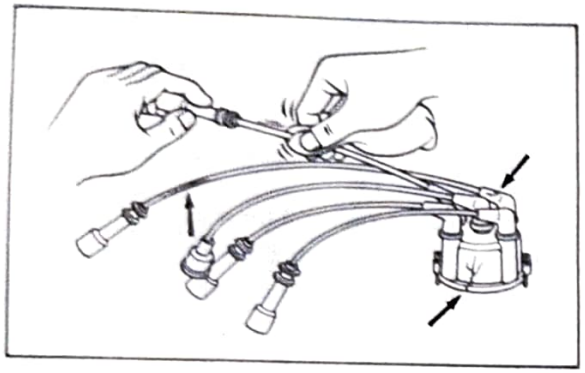
(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

NOTE: Oiliness may indicate a struck PCV valve.

If necessary, replace the air cleaner element.

(b) Clean element with compressed air.

First blow from inside thoroughly, then blow off the outside of the element.



INSPECT IGNITION WIRING AND DISTRIBUTOR CAP

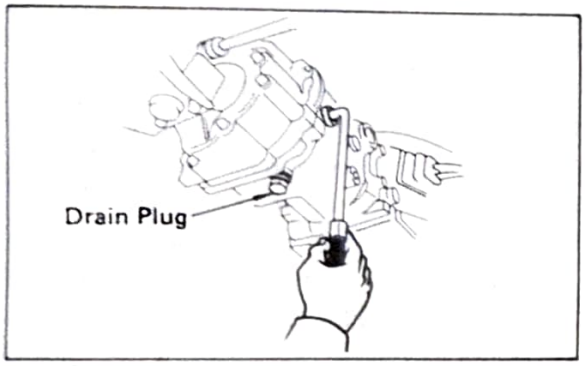
(a) Remove the distributor cap and wire.

(b) Clean the distributor cap and wires with a clean cloth.

(c) Visually inspect the wiring for cracks or damage.

(d) Visually inspect the cap for cracks, carbon tracks or worn.

NOTE: In areas where road salt is used, inspection and cleaning should be performed each year just after the snow season.



REPLACE TRANSMISSION, TRANSFER (RN 4x4) AND DIFFERENTIAL OIL

(a) Remove the drain plug and drain the oil.

(b) Reinstall the drain plug.

(c) Add new oil until it begins to run out of the filler hole.

Oil grade and viscosity: **See page 2-26**

Oil capacity:

Transmission –

RN 4x2

W50	**2.6 liters (2.7 US qts, 2.3 Imp.qts)**
L48	**2.0 liters (2.1 US qts, 1.8 Imp.qts)**
L52	**1.8 liters (1.9 US qts, 1.6 Imp.qts)**

RN 4x4

L45	**2.0 liters (2.1 US qts, 1.8 Imp.qts)**
L52	**1.8 liters (1.9 US qts, 1.6 Imp.qts)**

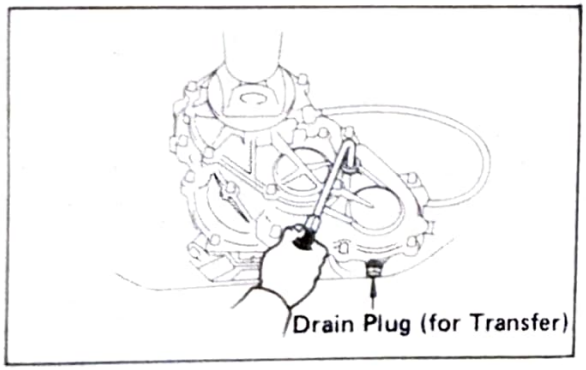
Transfer – 1.6 liters (1.7 US qts, 1.4 Imp.qts)

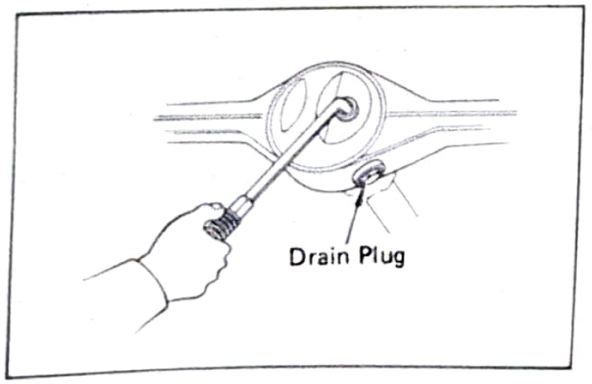
Differential –

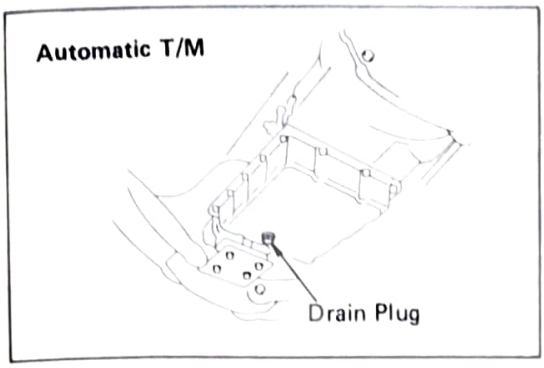
RN 4x2

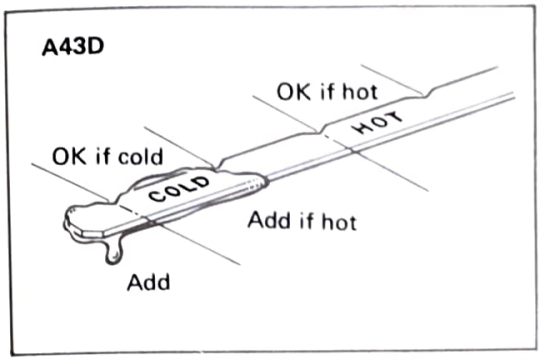
7.5 in.	**1.7 liters (1.8 US qts, 1.5 Imp.qts)**
8.0 in.	**1.8 liters (1.9 US qts, 1.6 Imp.qts)**

RN 4x4 Front or rear
2.2 liters (2.3 US qts, 1.9 Imp.qts)









RN 4x2 ONLY:
REPLACE AUTOMATIC TRANSMISSION FLUID

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

(c) With the engine OFF, add new fluid through the dipstick tube.

Fluid: ATF type F

Drain and refill capacity:
2.4 liters (2.5 US qts, 2.1 Imp. qts)

Dry fill capacity:
A43D 6.5 liters (6.9 US qts, 5.7 Imp. qts)

(d) Start the engine and shift the selector into all positions from P through L and then shift into P.

(e) With the engine idling, check the fluid level. Add fluid up to the COLD level on the dipstick.

CAUTION: Do not overfill.

TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

In addition to the scheduled maintenance items, check for loose or missing bolts and nuts of the following:

- Steering system
- Drive train
- Suspension system
- Fuel tank mounts
- Engine mounts, etc.

GENERAL MAINTENANCE

These are the maintenance and inspections items which are considered to be the owner's responsibility. They can be performed by the owner or he can have them done at a service shop. These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to perform.
Items and procedures for general maintenance are as follows.

OUTSIDE VEHICLE

1. TIRES
   (a) Check the pressure with a gauge. If necessary, adjust.
   (b) Check for cuts, damage or excessive wear.

2. WHEEL NUTS
   When checking the tires, check the nuts for looseness or for missing nuts. If necessary, tighten them.

3. TIRE ROTATION
   It is recommended that tires be rotated every 7,500 miles (12,000 km).

4. WINDSHIELD WIPER BLADES
   Check for wear or cracks whenever they do not wipe clean. If necessary, replace.

5. FLUID LEAKS
   (a) Check underneath for leaking fuel, oil, water or other fluid.
   (b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

6. DOORS AND ENGINE HOOD
   (a) Check that all doors and tailgate operate smoothly, and all latches lock securely.
   (b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

7. LIGHTS
   (a) Check that the headlights, stop lights, tail lights, turn signal lights, and other lights are all working.
   (b) Check the headlight aim.

8. WARNING LIGHTS AND BUZZERS
   Check that all warning lights and buzzers function properly.

9. HORN
   Check that it is works.

10. WINDSHIELD GLASS
    Check for scratches, pits or abrasions.

11. WINDSHIELD WIPER AND WASHER
    (a) Check operation of the wipers and washer.
    (b) Check that the wipers do not streak.

12. WINDSHIELD DEFROSTER
    Check that air comes out from the defroster outlet when operating the heater or air conditioner.

13. REAR VIEW MIRROR
    Check that it is mounted securely.

14. SUN VISORS
    Check that they move freely and are mounted securely.

15. STEERING WHEEL
    Check that it has specified freeplay. Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noise.

16. SEATS
    (a) Check that the seat adjusters operate smoothly.
    (b) Check that all latches lock securely in any position.
    (c) Check that the head restraint move up and down smoothly and that the locks hold securely in any latched position.
    (d) For folding-down seat backs, check that the latches lock securely.

17. SEAT BELTS
    (a) Check that the seat belt system such as buckles, retractors and anchors operate properly and smoothly.
    (b) Check that the belt webbing is not cut, frayed, worn or damaged.

18. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

19. CLUTCH PEDAL

Check the pedal for smooth operation.
Check that the pedal has the proper freeplay.

20. BRAKE PEDAL

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper reserve distance and freeplay.

(c) Check the brake booster function.

21. BRAKES

At a safe place, check that the brake does not pull to one side when applied.

22. PARKING BRAKE

(a) Check that the lever has the proper travel.

(b) On a safe incline, check that vehicle is held securely with only the parking brake applied.

23. AUTOMATIC TRANSMISSION "PARK" MECHANISM

(a) Check the lock release button of the selector lever for proper and smooth operation.

(b) On a safe incline, check that vehicle is held securely with the selector lever in "P" position and all brakes released.

UNDER HOOD

24. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

25. ENGINE COOLANT LEVEL

Check that the coolant level is between the "FULL" and "LOW" lines on the see-through reservoir.

26. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.

(b) Check the hoses for cracks, kinks, rot or loose connections.

27. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all battery cells is between upper and lower level lines on the case. If level is low, add only distilled water.

28. BRAKE AND CLUTCH FLUID LEVELS

(a) Check that the brake fluid level is near the upper level line on the see-through reservoir.

(b) Check that the clutch fluid level is up to the top of the narrow neck of the see-through reservoir.

29. ENGINE DRIVE BELTS

Check all drive belts for fraying, cracks, wear or oiliness.

30. ENGINE OIL LEVEL

Check the level on the dipstick with the engine turned off.

31. POWER STEERING FLUID LEVEL

Check the level on the dipstick.
The level should be in the "HOT" or "COLD" range depending on the fluid temperature.

32. AUTOMATIC TRANSMISSION FLUID LEVEL

(a) Park the vehicle on a level surface.

(b) With the engine idling and the parking brake applied, shift the selector into all positions from P to L, and then shift into P.

(c) Pull out the dipstick and wipe off the fluid with a clean rag. Re-insert the dipstick and check that the fluid level is in the HOT range.

(d) Perform this check with the fluid at normal driving temperature (70 – 80°C or 158 – 176°F).

NOTE: Wait until the engine cools down (about 30 mins.) before checking the fluid level after extended high-speed driving in hot whether, driving in heavy traffic or pulling a trailer.

33. EXHAUST SYSTEM

Visually inspect for cracks, holes or loose supports.
If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

MINOR ENGINE

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TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty	Troubleshoot cooling system	6-2
	Incorrects ignition timing	Reset timing	3-106
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	7-2
Engine will not start/ Hard to start (cranks okay)	No fuel supply to carburetor	Troubleshoot fuel system	5-2
	Carburetor problems	Repair as necessary	
	• Choke operation		3-20
	• Flooding		3-20
	• Needle valve sticking or clogged		3-20
	• Vacuum hose disconnected or damaged		
	• Fuel cut solenoid valve not open		3-20
	Ignition problems		
	• Ignition coil	Inspect coil	3-7
	• Igniter	Inspect igniter	3-8
	• Distributor	Inspect distributor	3-9
	Spark plugs faulty	Inspect plugs	3-6
	Ignition wirings disconnected or broken	Inspect wiring	
	Vacuum leaks	Repair as necessary	
	• PCV line		3-43
	• EGR line		3-58
	• MC line		3-53
	• Intake manifold		
	Compression low	Check compression	4-2
Rough idle or stalls	Spark plugs faulty	Inspect plugs	3-6
	Ignition wirings faulty	Inspect wiring	
	Ignition problems		
	• Ignition coil	Inspect coil	3-7
	• Igniter	Inspect igniter	3-8
	• Distributor	Inspect distributor	3-9
	Incorrect ignition timing	Reset timing	3-106
	Vacuum leaks	Repair as necessary	
	• PCV line		3-43
	• EGR line		3-58
	• MC line		3-53
	• HAC line		3-86
	• Intake manifold		
	Incorrect valve clearance	Adjust valve clearance	2-7
	Carburetor problems	Repair as necessary	
	• Idle speed incorrect		3-107,108
	• Slow jet clogged		3-20
	• Idle mixture incorrect		3-108,111
	• Fuel cut solenoid valve not open		3-20
	• Fast idle speed setting incorrect (cold engine)		3-109
	• Choke system faulty		3-93

TROUBLESHOOTING (CONT'D)

Problem	Possible cause	Remedy	Page
Rough idle or stalls (cont'd)	HAI system faulty	Check HAI system	3-91
	Engine overheats	Check cooling system	6-2
	EGR valve faulty	Check EGR valve	3-58
	MC valve faulty	Check MC valve	3-53
	Compression low	Check compression	4-2
Engine hesitates/ Poor acceleration	Spark plugs faulty	Inspect plugs	3-6
	High tension wires faulty	Inspect wiring	3-6
	Vacuum leaks	Repair as necessary	
	• PCV line		3-43
	• EGR line		3-58
	• HAC line		3-86
	• Intake manifold		
	Incorrect ignition timing	Reset timing	3-106
	Air cleaner clogged	Check air cleaner	2-23
	Fuel line clogged	Check fuel line	5-2
	Carburetor problems	Repair as necessary	
	• Float level too low		3-20
	• Accelerator pump faulty		3-20
	• Power valve faulty		3-20
	• Choke system faulty		3-93
	Emission control system problem		
	• HAI system always on (hot engine)	Check HAI system	3-91
	• EGR system always on (cold engine)	Check EGR system	3-58
	• AAP system faulty (cold engine)	Check AAP system	3-99
	• HAC system faulty	Check HAC system	3-86
	Engine overheats	Check cooling system	6-2
	Compression low	Check compression	4-2
Engine dieseling (turns when ignition switch is turned off)	Carburetor problems	Repair as necessary	
	• Linkage sticking		
	• Idle speed or fast idle speed out of adjustment		3-107, 108, 109
	• Fuel cut solenoid faulty		3-101
	Incorrect ignition timing	Reset timing	3-106
	EGR system faulty	Check EGR system	3-58
Muffler explosion (after fire) on deceleration only	AI system faulty	Check AI system	3-68
	AS system faulty	Check AS system	3-78
	Deceleration fuel cut system always off	Check fuel cut system	3-101
	MC system faulty	Check MC system	3-53
Muffler explosion (after fire) all the time	Air cleaner clogged	Check air cleaner	2-23
	Choke system faulty	Check choke system	3-93
	Incorrect ignition timing	Reset timing	3-109
	Incorrect valve clearance	Adjust valve clearance	2-7

TROUBLESHOOTING (CONT'D)

Problem	Possible cause	Remedy	Page
Engine backfires	Choke valve open (cold engine)	Check choke system	3-93
	Carburetor vacuum leak	Check hoses and repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	5-2
	Incorrect ignition timing	Reset timing	3-106
	Incorrect valve clearance	Adjust valve clearance	2-7
	Carbon deposits in combustion chambers	Inspect cylinder head	4-8
Excessive oil consumption	Oil leak	Repair as necessary	
	PCV line clogged	Check PCV system	3-43
	Piston ring worn or damaged	Check rings	4-31
	Valve stem oil seal worn or damaged	Check oil seal	4-3
	Valve stem and guide worn	Check valve and guides	4-9
Poor gasoline mileage	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air cleaner	2-23
	Incorrect ignition timing	Reset timing	3-106
	Carburetor problems • Choke system faulty • Idle speed too high • Deceleration fuel cut system faulty • Power valve always open	Repair as necessary	 3-93 3-107,108 3-101 3-20
	Spark plugs faulty	Inspect plugs	3-6
	SC system faulty	Check SC system	3-55
	EGR system always on	Check EGR system	3-58
	Compression low	Check compression	4-2
	Tires improperly inflated	Inflate tires to proper pressure	13-3, 28
	Clutch slips	Troubleshoot clutch	9-2
	Brakes drag	Troubleshoot brakes	15-2

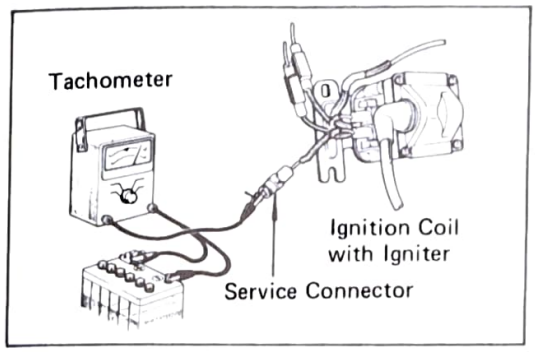
SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Voltmeter/ohmmeter	Commercial	To check ignition and emission control systems
Carburetor driver set	09860-11011	To disassemble carburetor
5 mm wrench	09922-00010 or Commercial	To remove and install slow jet
Carburetor adjustment gauge set	09240-00014	To adjust carburetor
Air pump tester	09258-14010	To check air pump

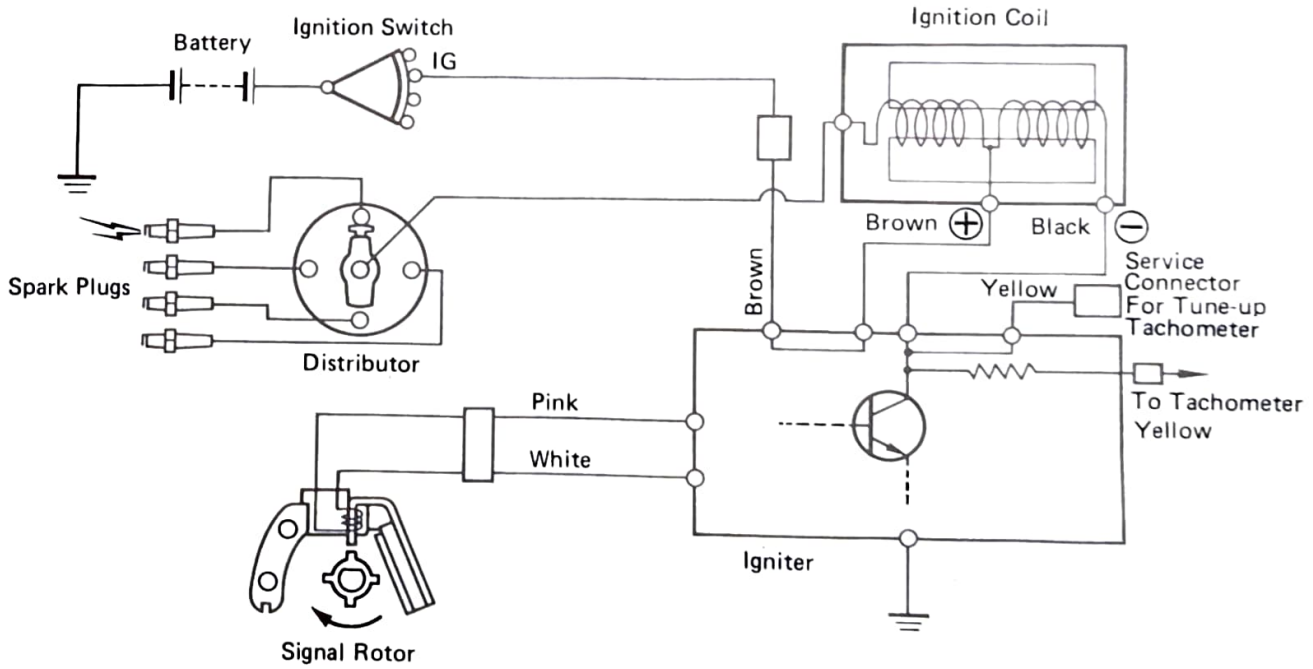
IGNITION SYSTEM

Precautions

1. Do not allow the ignition switch to be on for more than 10 minutes if the engine will not start.
2. When a tachometer is connected to the system, connect the tachometer (+) terminal to the service connector. Do not connect the tachometer (+) terminal to the distributor.
3. As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacture.
4. NEVER allow the ignition coil terminals or service connector to touch ground as it could result in damage to the ignitor and/or ignition coil.
5. Do not disconnect the battery when the engine is running.
6. Make sure that the ignitor is properly grounded to the body.



System Circuit



On-Vehicle Inspection

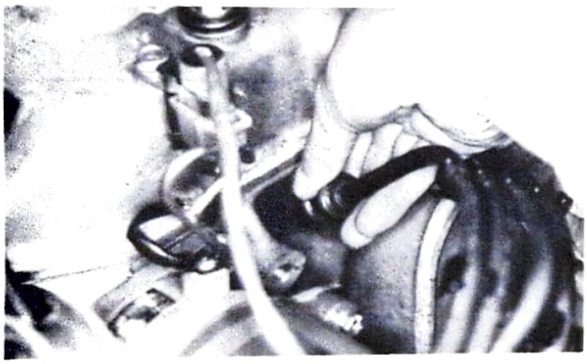
SPARK TEST

NOTE: Perform this test to check that voltage is coming from the distributor.

1. CONNECT TIMING LIGHT TO EACH SPARK PLUG
2. CRANK ENGINE AND CHECK THAT LIGHT FLASHES

   If the timing light does not flash, check wiring connections, ignition coil, igniter, distributor or ignition switch.

INSPECTION OF HIGH TENSION WIRE



1. CAREFULLY REMOVE HIGH TENSION WIRES BY PULLING ONLY ON RUBBER BOOTS

   CAUTION: DO NOT pull on the wires or bend the wires. The conductor inside may be damaged.

2. INSPECT WIRE TERMINALS

   Check terminals for corrosion, breaks or distortion. Replace wire as required.

3. CHECK WIRE RESISTANCE

   Using an ohmmeter, check that the resistance does not exceed the maximum. Replace the wire as required.

   Maximum resistance: 25 kilo-ohms per cord

INSPECTION OF SPARK PLUG

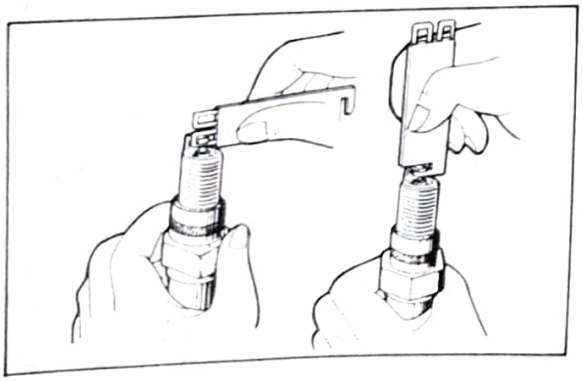
1. REMOVE SPARK PLUGS AND CHECK FOLLOWING:

   (a) Electrode wear
   (b) Carbon deposits
   (c) Thread damage
   (d) Insulator damage

   If a problem is found, replace the plugs.

   Spark plug:

ND	**W16EXR-U**
NGK	**BPR5EA-L, BPR5EY**

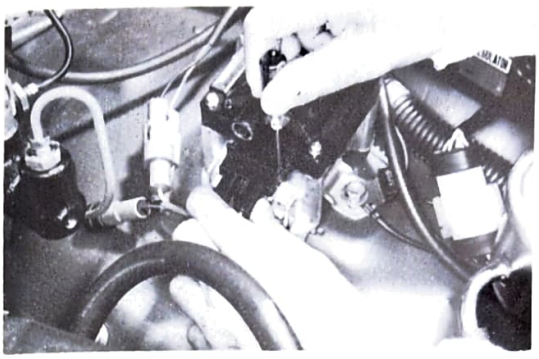


2. GAP AND INSTALL SPARK PLUGS

   (a) Clean old plugs with a spark plug cleaner or wire brush.

   (b) Carefully bend the outer electrode to obtain the correct electrode gap.

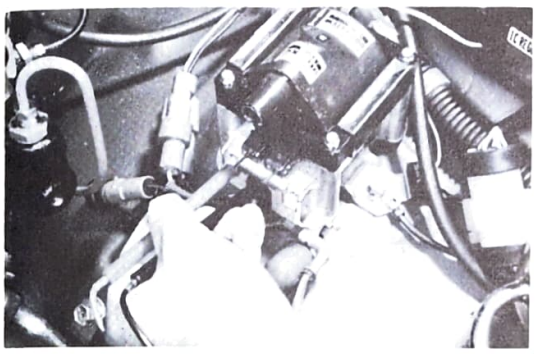
   Gap: **0.8 mm (0.031 in.)**



INSPECTION OF IGNITION COIL

1. DISCONNECT HIGH TENSION WIRE AND IGNITION COIL CONNECTOR

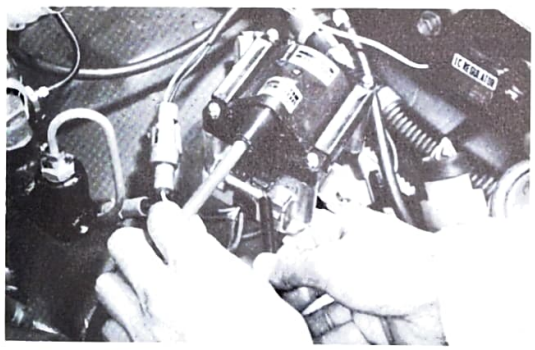
2. CLEAN COIL AND CHECK FOLLOWING:
   (a) Check for cracks or damage.
   (b) Check the terminals for carbon paths.
   (c) Check the high-tension wire hole for carbon deposits and corrosion.



3. MEASURE PRIMARY COIL RESISTANCE

   Using an ohmmeter, measure the resistance between the positive ⊕ (Brown side) and negative ⊖ (Black side) terminals.

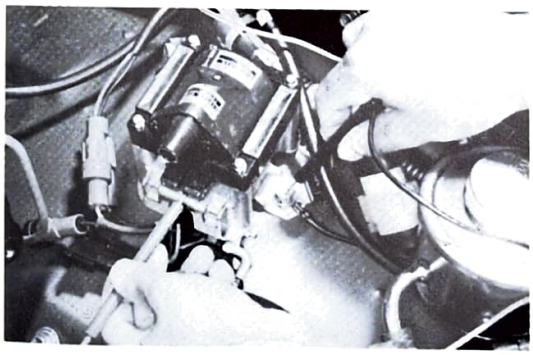
   Primary coil resistance (cold): 0.4 — 0.5 ohm



4. MEASURE SECONDARY COIL RESISTANCE

   Using an ohmmeter, measure the resistance between the positive ⊕ terminal (Brown side) and the high tension terminal.

   Secondary coil resistance (cold): 8.5 — 11.5 kilohms

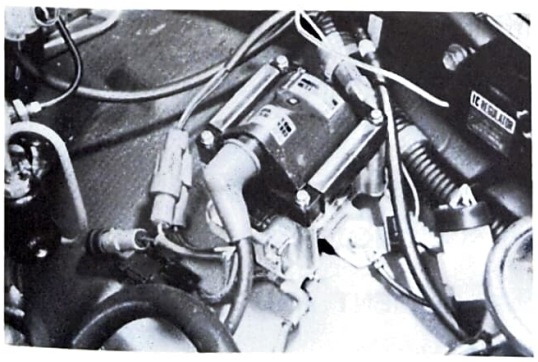


5. MEASURE INSULATION RESISTANCE

   Using an ohmmeter, measure the resistance between the positive ⊕ terminal and the igniter body.

   Insulation resistance: Infinity

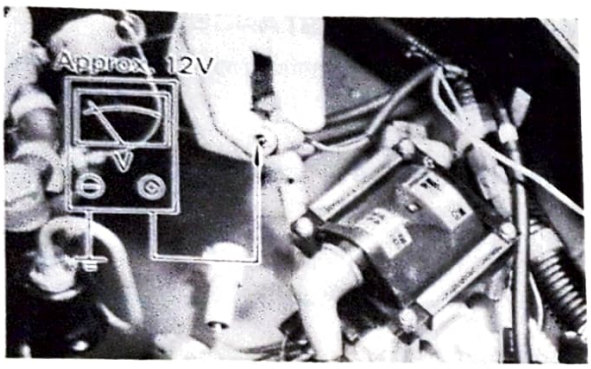
   If a problem with the coil is found, replace the coil.



6. CONNECT HIGH TENSION WIRE AND IGNITION COIL CONNECTOR

INSPECTION OF IGNITER

1. TURN IGNITION SWITCH ON

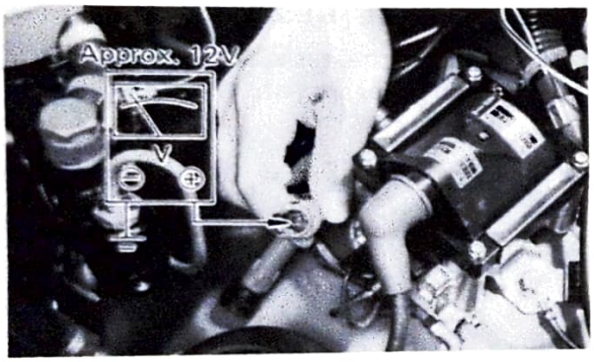


2. CHECK POWER SOURCE LINE VOLTAGE

(a) Disconnect the wiring connector for Brown and Yellow.

(b) Using a voltmeter, connect the positive ⊕ probe to the Brown connector for wire harness side and the negative ⊖ probe to the body ground.

Voltage: Approx. 12 volts

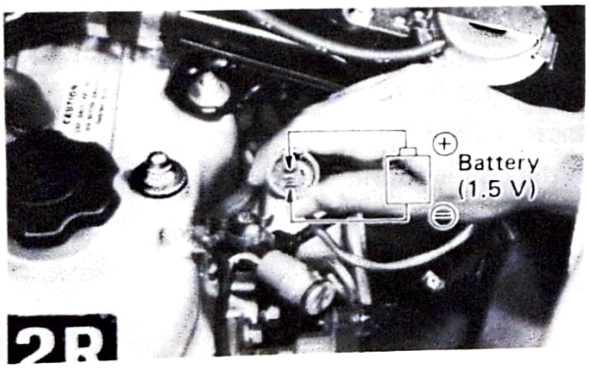


3. CHECK POWER TRANSISTOR IN IGNITER

(a) Connect the wiring connector for Brown.

(b) Using a voltmeter, connect the positive ⊕ probe to the Yellow connector for igniter side and the negative ⊖ probe to the body ground.

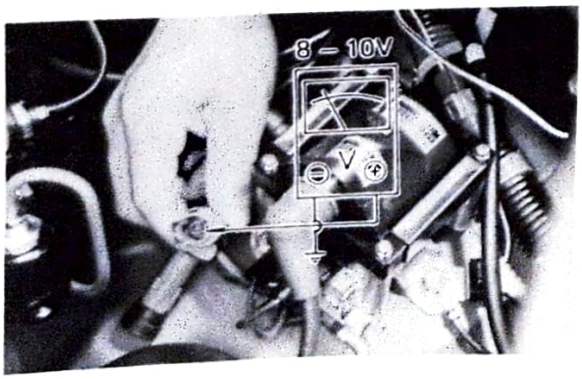
Voltage: Approx. 12 volts



(c) Unplug the wiring connector from the distributor.

(d) Using a dry cell battery (1.5 volts), connect the positive ⊕ pole of the battery to the Pink wire terminal and the negative ⊖ pole to the White wire terminal.

CAUTION: Do not apply the voltage more than 5 seconds to avoid destroying the power transistor in the igniter.



(e) Using a voltmeter, connect the positive ⊕ probe to the Yellow connector for igniter side and the negative ⊖ probe to the body ground.

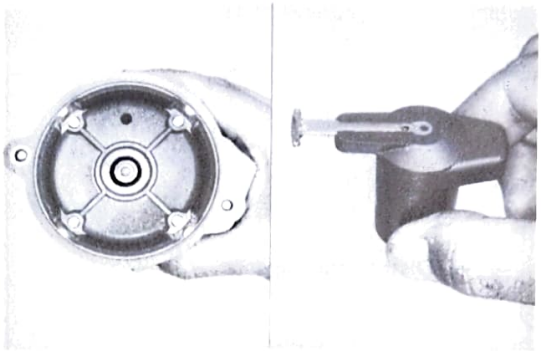
Voltage: 8 – 10 volts

If a problem is found, replace the igniter.

4. TURN IGNITION SWITCH OFF

5. REMOVE TEST EQUIPMENT AND RECONNECT WIRING

ON-VEHICLE INSPECTION OF DISTRIBUTOR

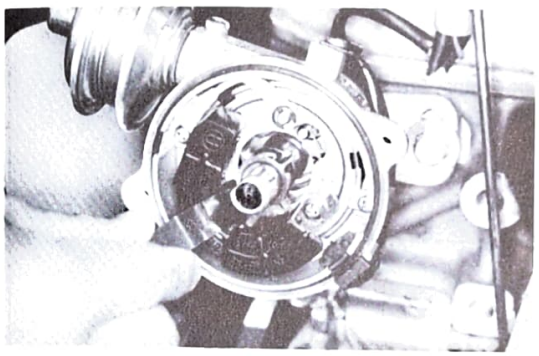


1. INSPECT DISTRIBUTOR CAP AND ROTOR

(a) Check for cracks, carbon tracks, burnt or corroded terminals.

(b) Check the distributor center contact for wear.

If a problem is found, replace the component.



2. CHECK AIR GAP

(a) Using a feeler gauge, measure the gap between the timing rotor and the pick up coil projection.

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)

(b) Adjust the gap if necessary.

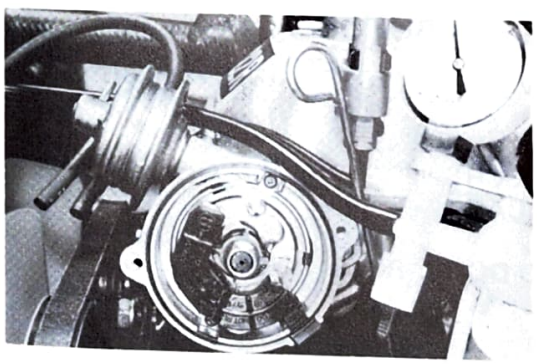
- Loosen two screws and move the signal generator until the gap is correct. Tighten the screws and recheck the gap.

3. CHECK SIGNAL GENERATOR

Using an ohmmeter, check the resistance of the signal generator.

Generator resistance: 140 – 180 ohms

If the resistance is not correct, replace the signal generator.



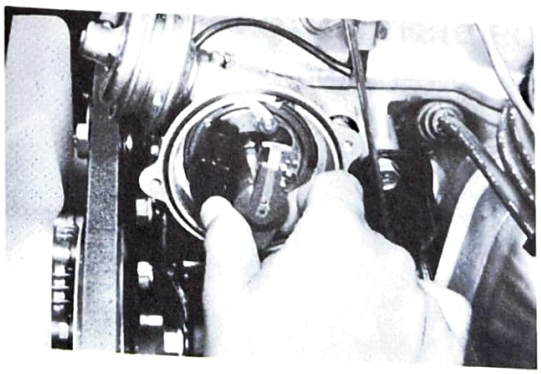
4. CHECK VACUUM ADVANCE

(a) Remove the distributor cap.

(b) Disconnect the vacuum hose and connect a vacuum pump to the diaphragms.

(c) Apply the vacuum and check that the vacuum advance moves.

If the vacuum advance does not work, repair or replace as necessary.

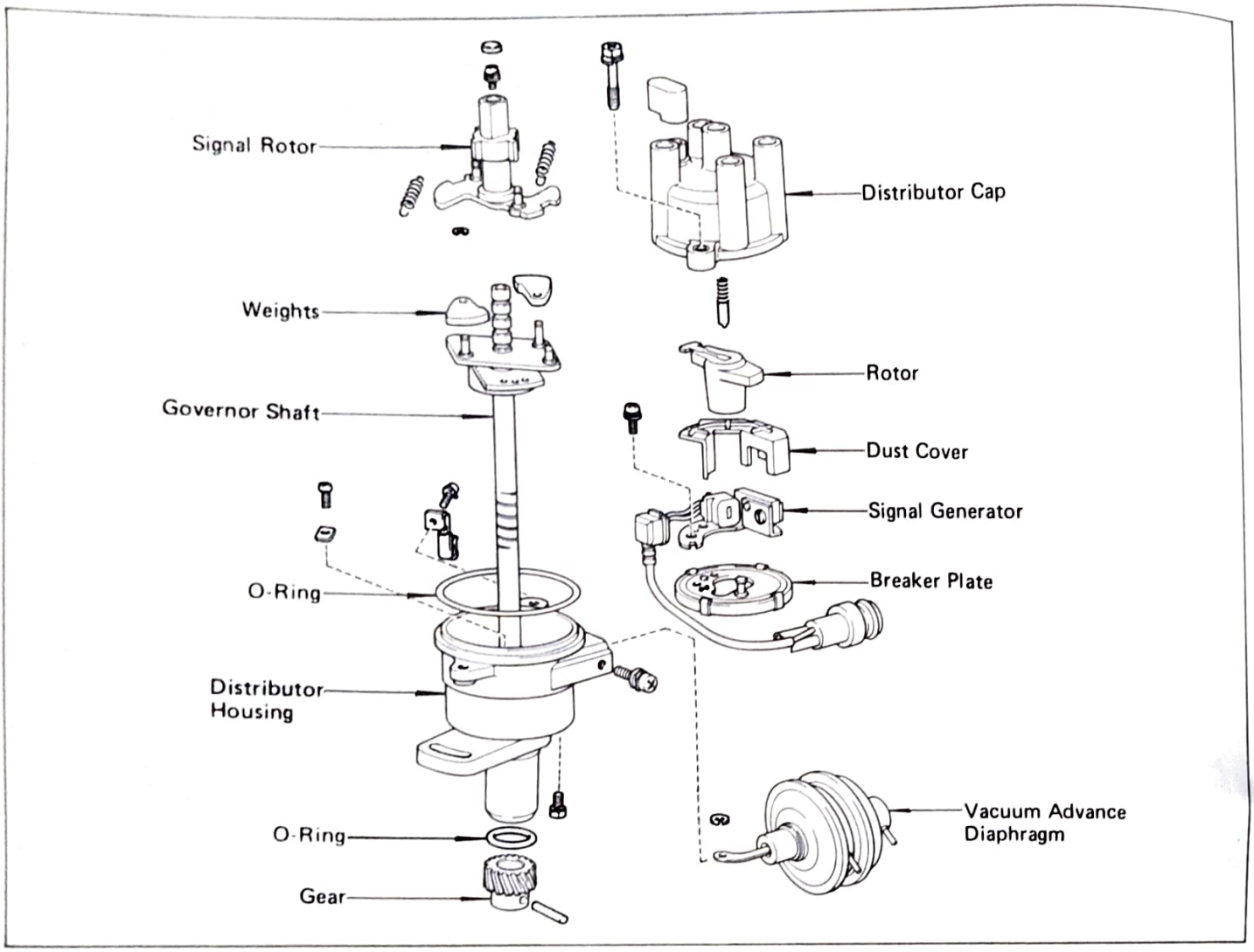


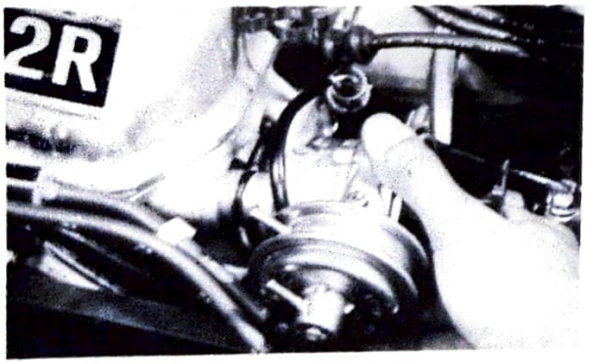
5. CHECK GOVERNOR ADVANCE

(a) Turn the rotor shaft clockwise, release it, and check that the rotor returns slightly counterclockwise.

(b) Check that the rotor shaft is not excessively loose.

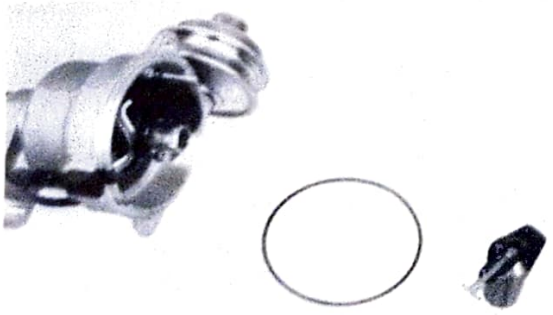
Distributor





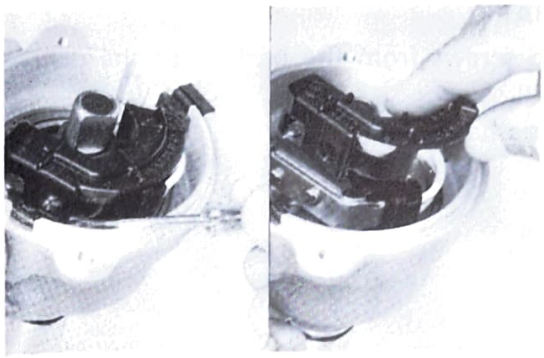
REMOVAL OF DISTRIBUTOR

1. DISCONNECT VACUUM HOSES AND WIRING CONNECTOR
2. REMOVE TWO SCREWS AND PULL OFF DISTRIBUTOR CAP
3. REMOVE HOLD-DOWN BOLT AND PULL OUT DISTRIBUTOR



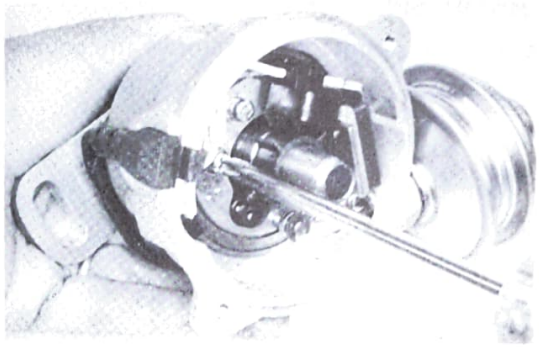
DISASSEMBLY OF DISTRIBUTOR

1. REMOVE ROTOR AND O-RING



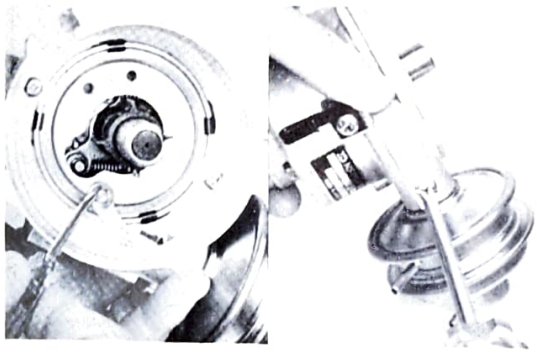
2. REMOVE DUST COVER

Using a small screwdriver, pry off the cover and remove it.



3. REMOVE SIGNAL GENERATOR

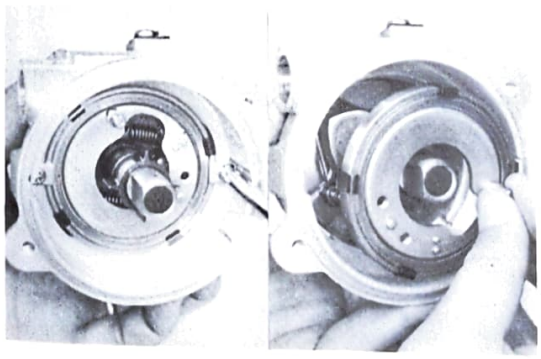
Remove two screws and pull out the signal generator.



4. REMOVE VACUUM ADVANCE

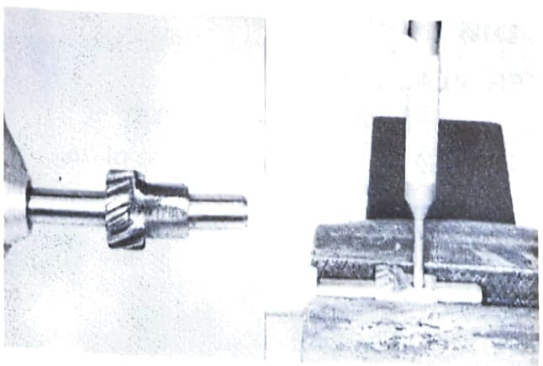
(a) Remove E-ring and screw.

(b) Pull out the vacuum advance.



5. REMOVE BREAKER PLATE

Remove two screws and pull out the breaker plate.



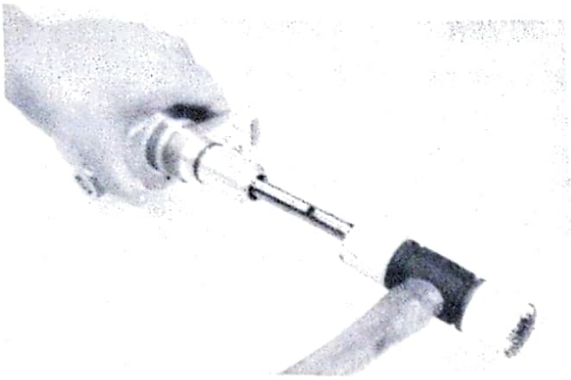
6. REMOVE DRIVE GEAR

(a) Using a grinding wheel, grind the gear and pin.

CAUTION: Be careful not to damage the shaft.

(b) Using a punch and hammer, drive out the pin.

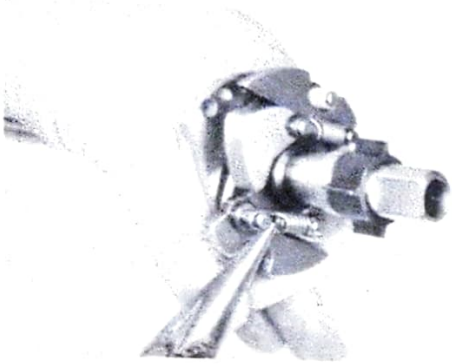
(c) Remove the drive gear and discard it.



7. DRIVE OUT SHAFT

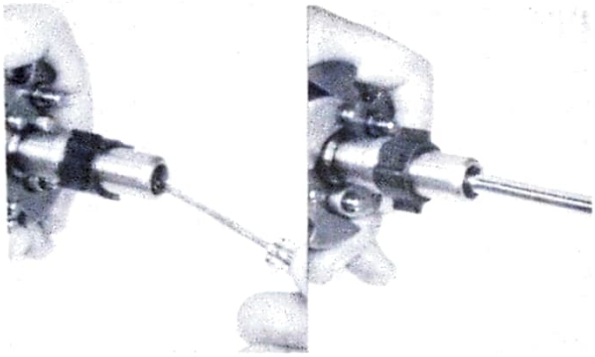
(a) Remove two screws from the bottom of the distributor housing.

(b) Using a plastic hammer, carefully drive out the shaft.



8. REMOVE GOVERNOR SPRINGS

Using needle nose pliers, disconnect and remove the governor springs.

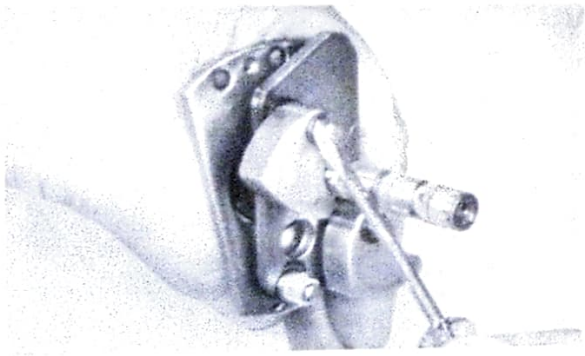


9. REMOVE SIGNAL ROTOR

(a) Pry out the grease stopper.

(b) Remove the screw at the end of the governor shaft.

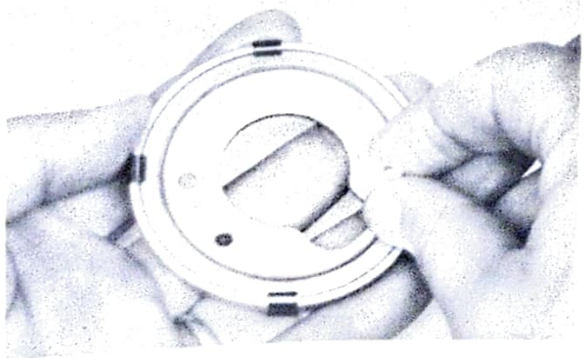
(c) Pull off the signal rotor.



10. REMOVE GOVERNOR WEIGHT SNAP RINGS AND WEIGHTS

Using a screwdriver, remove the E-rings and pull off the governor weights.

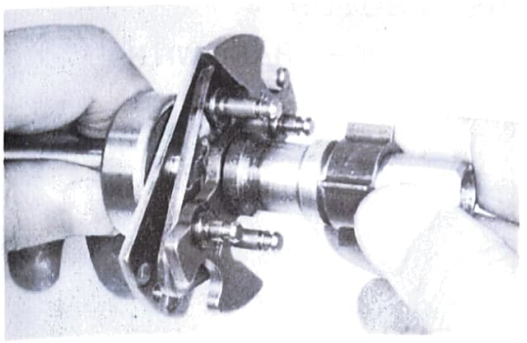
INSPECTION OF DISTRIBUTOR



1. CHECK BREAKER PLATE

Turn the plate and check that it has a slight drag.

If strong resistance or sticking is felt, replace the plate.

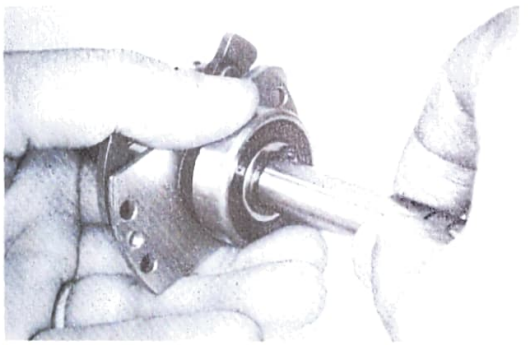


2. CHECK SIGNAL ROTOR

Check the signal rotor for damage and correct fit on the distributor shaft.

3. CHECK GOVERNOR WEIGHTS, SPRINGS AND BUSHINGS

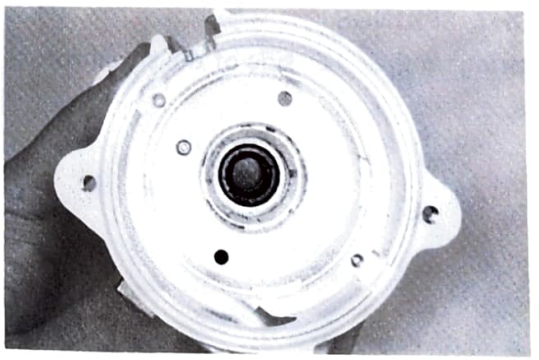
Check for wear, deformation or damage.



4. CHECK GOVERNOR SHAFT AND BEARING

(a) Check the bearing for wear, sticking or damage.

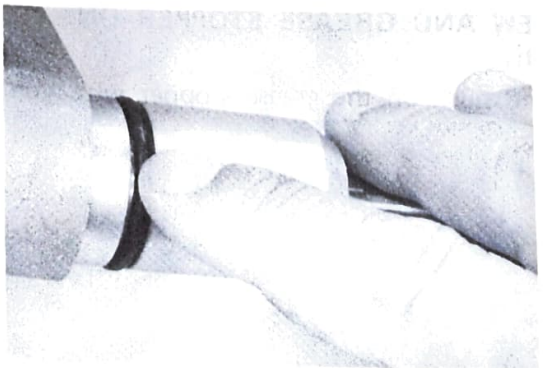
(b) Check the shaft for wear or damage.



5. CHECK DISTRIBUTOR HOUSING

Check the housing, bushing and oil seal for wear, deformation or damage.

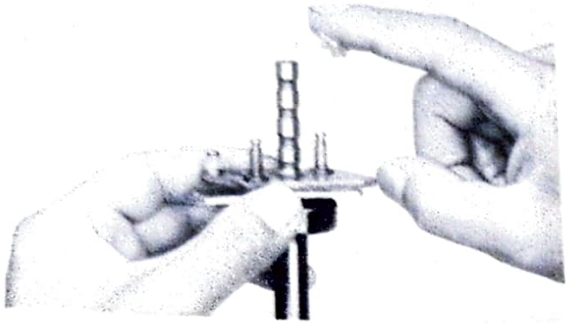
If a problem is found, replace the distributor housing.



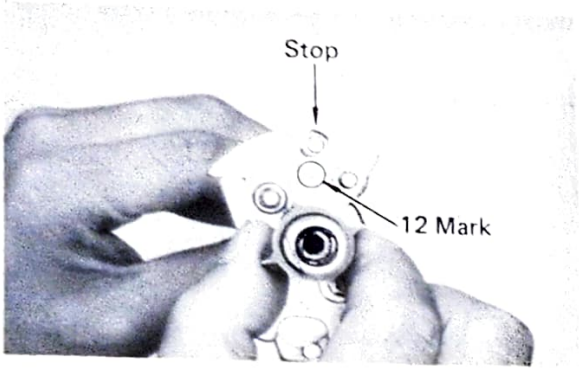
6. REPLACE O-RING ON HOUSING

Remove the O-ring and check the groove for damage. Install a new O-ring.

ASSEMBLY OF DISTRIBUTOR

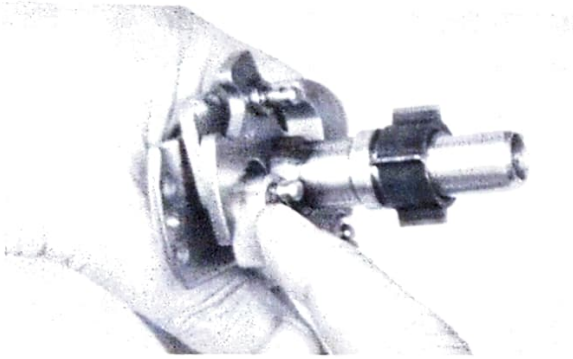


1. LIGHTLY COAT GOVERNOR SHAFT WITH GREASE



2. INSTALL SIGNAL ROTOR ON GOVERNOR SHAFT

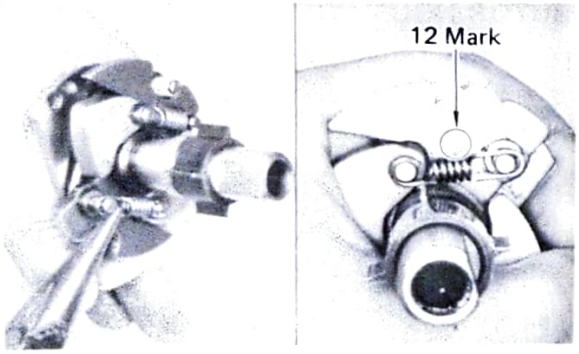
Align the figure "12" with the stop.



3. INSTALL GOVERNOR WEIGHTS

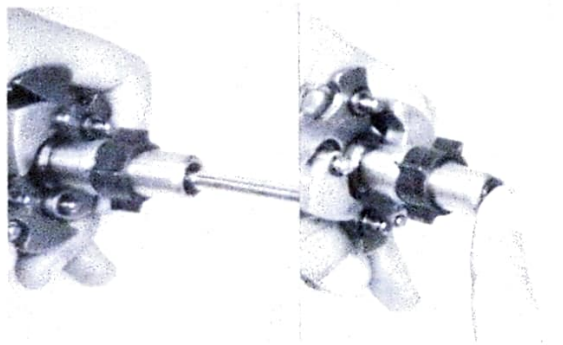
(a) Slide the bearings and weights over the small shafts.

(b) Install the E-rings.



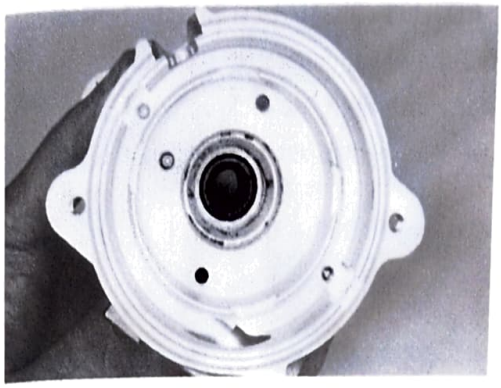
4. INSTALL WEIGHT SPRINGS

Install the long spring on the "12" side of the signal rotor.

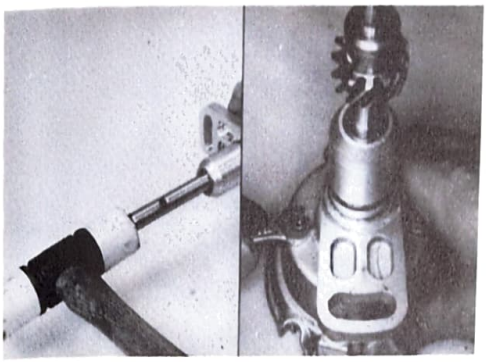


5. INSTALL SCREW AND GREASE STOPPER ON SIGNAL ROTOR

Apply grease and push on the grease stopper with your finger.



6. APPLY MP GREASE TO OIL SEAL

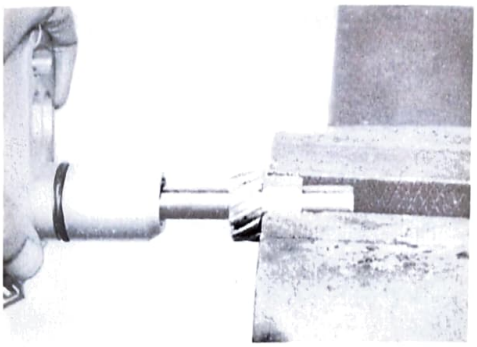


7. INSTALL GOVERNOR SHAFT

(a) Align the holes in the bearing retainer and housing.

(b) Tap in the shaft.

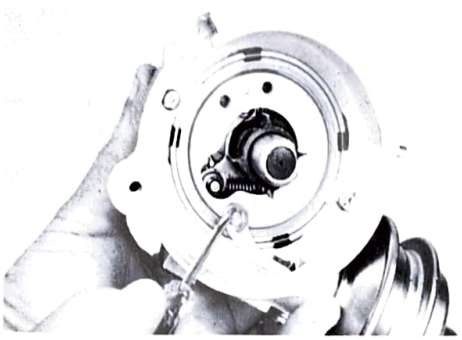
(c) Install two screws.



8. INSTALL NEW GEAR AND PIN

(a) Align the holes. Using a hammer, install the pin.

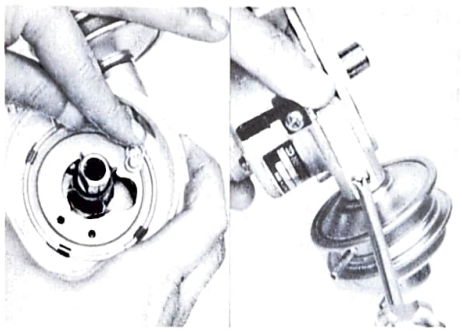
(b) Secure both ends of the pin in a vise.



9. INSTALL BREAKER PLATE

(a) Fit the four clips on the breaker plate into the housing slots.

(b) Install two hold-down clips with two screws.

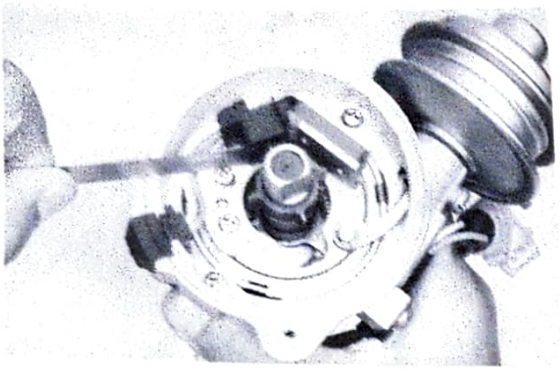


10. INSTALL VACUUM ADVANCER

(a) Insert the vacuum advancer with a gasket into the distributor and place the lever hole over the plate pin.

(b) Install the E-ring on the pin.

(c) Install and tighten the advancer screw.



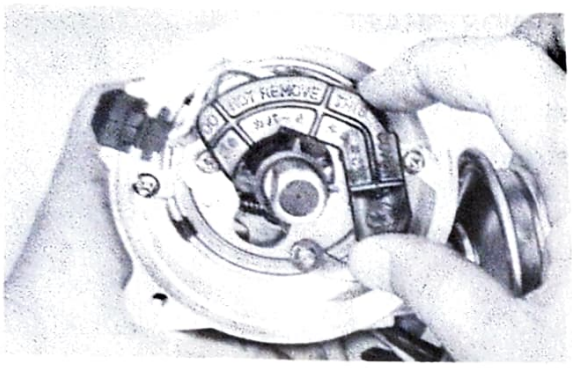
11. INSTALL AND ADJUST SIGNAL GENERATOR

(a) Loosely install the signal generator with two screws.

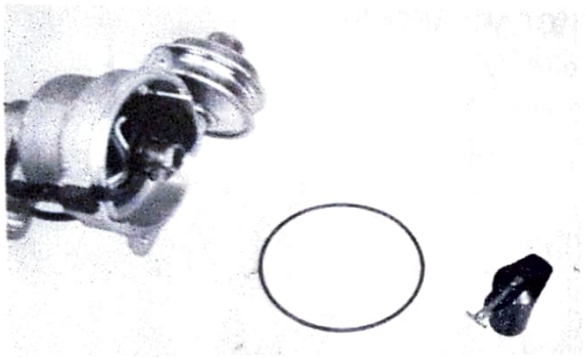
(b) Align the rotor tooth with the pick-up coil.

(c) Using a brass feeler gauge, set the air gap and tighten two screws.

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)



12. INSTALL DUST COVER



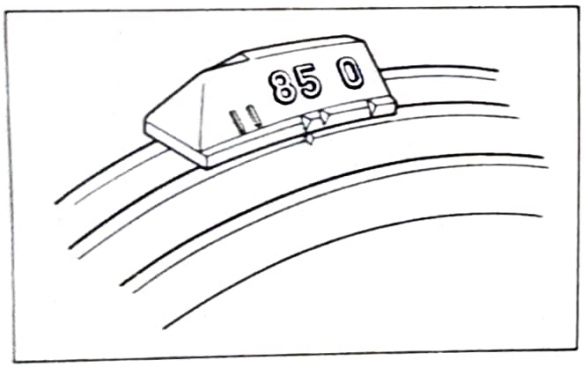
13. INSTALL O-RING AND ROTOR

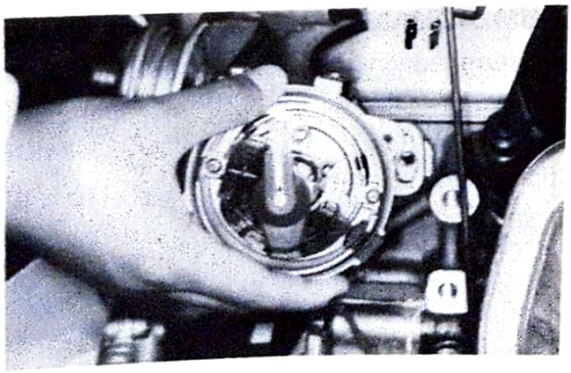
INSTALLATION OF DISTRIBUTOR

1. SET TIMING MARK ON CRANK PULLEY

Turn the crankshaft pulley until the timing mark is aligned with the 8° BTDC mark.

NOTE: Check that the rocker arms on the No. 1 cylinder are loose. If not, turn the crankshaft one full turn.

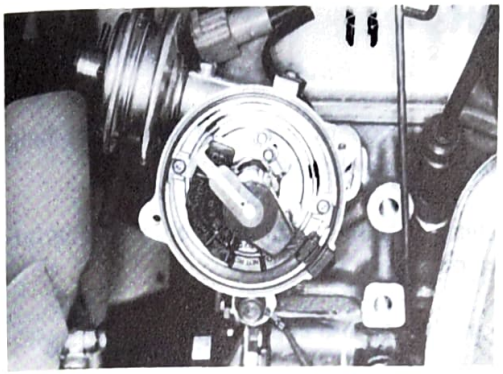




2. INSTALL DISTRIBUTOR

(a) Temporarily install the rotor.

(b) Begin insertion of the distributor with the rotor pointing up and the distributor mounting hole approximately at center position of the bolt hole.



(c) When fully installed, the rotor will rotate to the position shown.

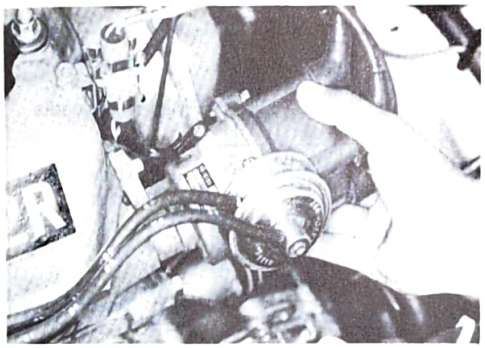
(d) Align the rotor tooth with the pick-up coil.

(e) Coat the distributor set bolt with sealer and install the bolt. Torque the bolt.

Torque: 1.8 – 2.6 kg-m (14 – 18 ft-lb)

3. INSTALL FOLLOWING PARTS:

(a) Distributor cap with high tension wires
(b) Vacuum hose(s)
(c) Wiring connector



4. ADJUST IGNITION TIMING

(a) Connect a timing light to the engine.

(b) Start the engine and run it at idle.

(c) Using a timing light, slowly turn the distributor until the timing mark on the crankshaft pulley is aligned with the 8° mark. Tighten the distributor bolt.

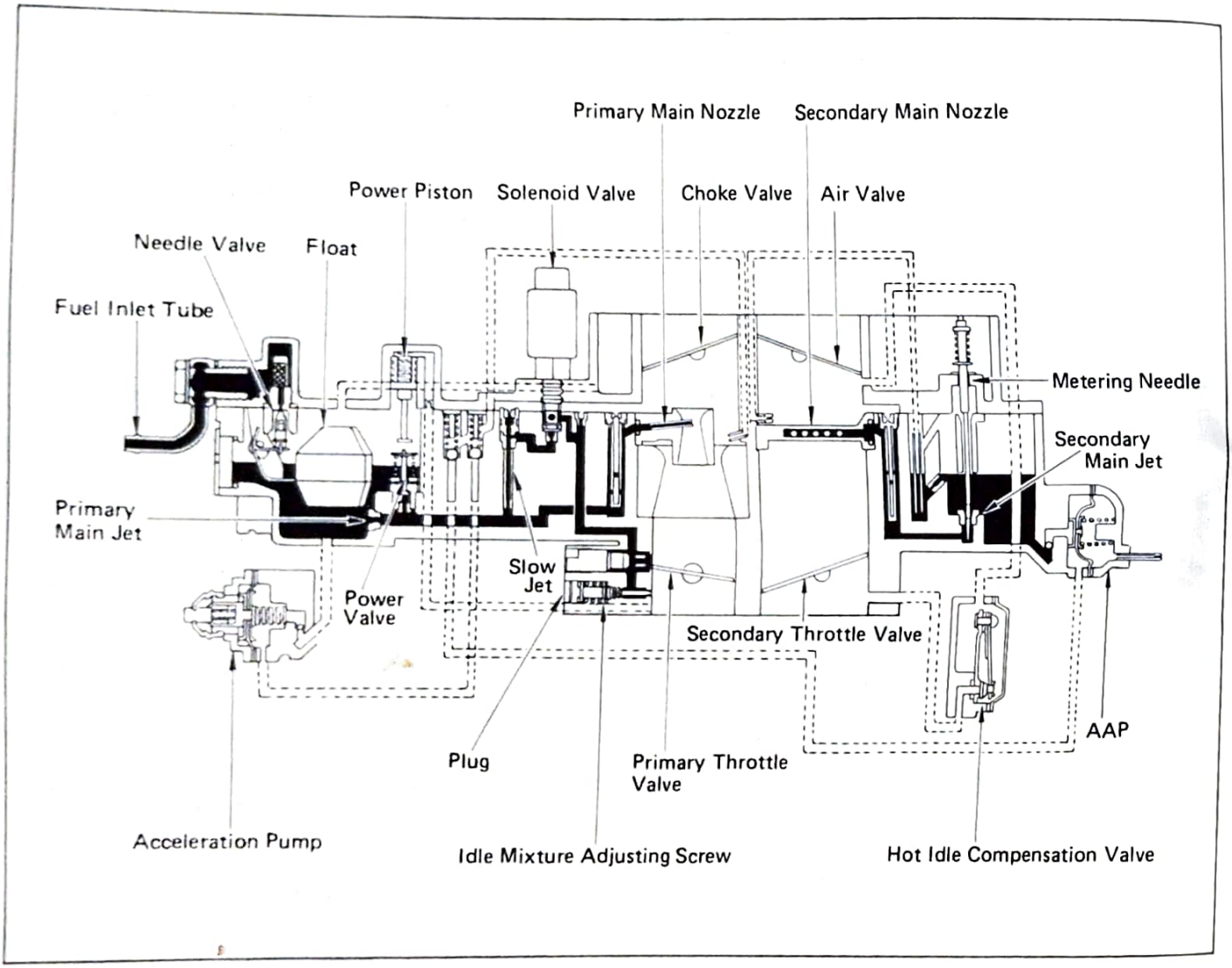
Ignition timing: 8° BTDC @ Max. 950 rpm
(w/ Vacuum advancer off)

Torque: 1.8 – 2.6 kg-m (14 – 18 ft-lb)

CARBURETOR
Precautions

1. Work on only one component group at a time to help avoid confusion between similar looking parts.
2. Keep work area clean to avoid contamination of the carburetor and components.
3. Be careful not to mix up or lose clips or springs.

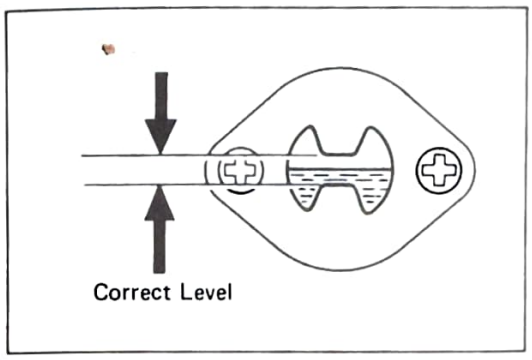
Carburetor Circuit



On-Vehicle Inspection

1. REMOVE AIR CLEANER (See page 3-21)

2. CHECK CARBURETOR AND LINKAGE
   (a) Check that the various set screws, plugs and union bolts are tight and correctly installed.
   (b) Check the linkage for excessive wear and missing snap rings.
   (c) Check that the throttle valves open fully when the accelerator pedal is fully depressed.



3. CHECK FLOAT LEVEL
   Check that the fuel level is about even with the correct level in the sight glass.
   If not, check the carburetor needle valve and float level, and adjust or repair, as necessary.

COLD ENGINE

4. CHECK AUTOMATIC CHOKE SYSTEM (See page 3-94)

5. CHECK CHOKE OPENER SYSTEM (See page 3-97)

6. CHECK CHOKE BREAKER SYSTEM (See page 3-95)

7. CHECK AAP SYSTEM (See page 3-100)

8. CHECK OUTER VENT CONTROL VALVE (See page 3-47)

HOT ENGINE

9. CHECK AUTOMATIC CHOKE SYSTEM (See page 3-94)

10. CHECK CHOKE OPENER SYSTEM (See page 3-97)

11. CHECK AAP SYSTEM (See page 3-99)

12. CHECK FUEL CUT SYSTEM (See page 3-101)

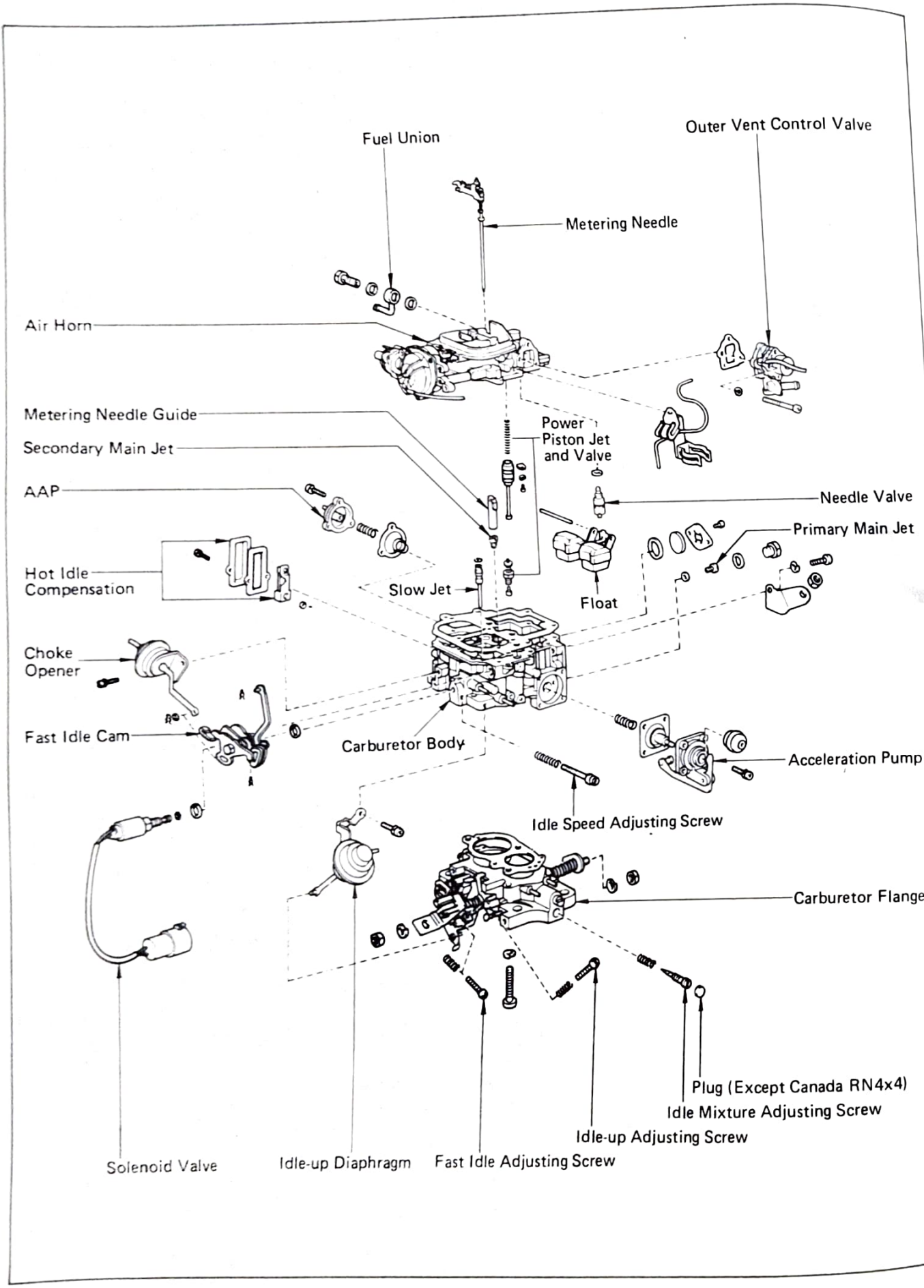
13. INSTALL AIR CLEANER (See page 3-36)

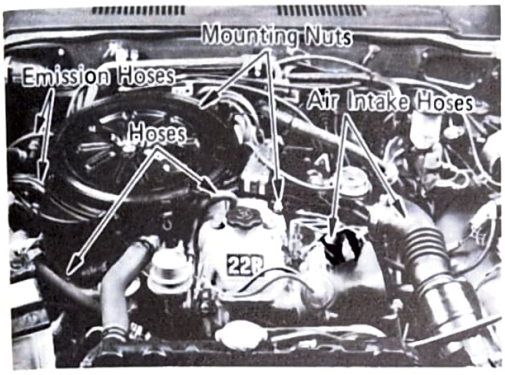
14. CHECK AND ADJUST IDLE SPEED
    (Except Canada RN 4x4) (See page 3-107)
    Idle speed: 700 rpm – M/T
    750 rpm – A/T

15. CHECK AND ADJUST IDLE SPEED AND MIXTURE
    (Canada RN 4x4) (See page 3-108)
    Idle speed: 700 rpm
    (Idle mixture speed: 740 rpm)

16. CHECK AND ADJUST FAST IDLE SPEED
    (See page 3-109)

Carburetor Overhaul





REMOVAL OF CARBURETOR

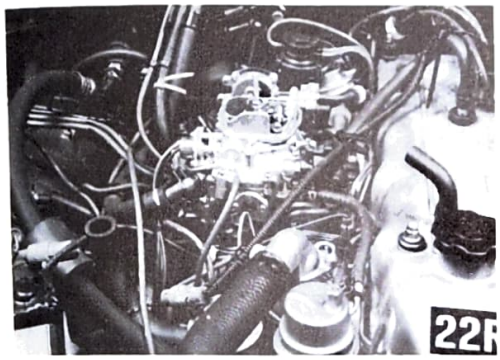
1. REMOVE AIR CLEANER

(a) Disconnect the emission control hoses.

(b) Disconnect the air intake hose.

(c) Remove the two mounting nuts and butterfly nut.

(d) Lift the air cleaner off the carburetor.



2. DISCONNECT ACCELERATOR LINKAGE FROM CARBURETOR

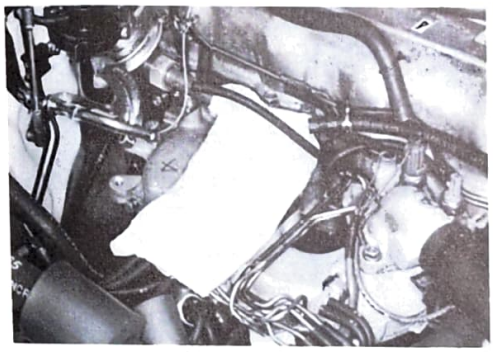
3. DISCONNECT THROTTLE CABLE FOR AUTOMATIC TRANSMISSION

4. DISCONNECT FOLLOWING HOSES FROM CARBURETOR:

(a) Emission control hoses

(b) PCV hose from the flange

(c) Fuel hose

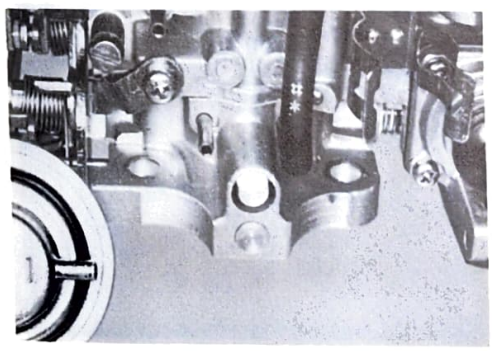


5. REMOVE CARBURETOR

(a) Remove the carburetor mounting bolts and nuts.

(b) Lift out the carburetor.

(c) Cover the inlet hole of the intake manifold with a cloth.



DISASSEMBLY OF CARBURETOR

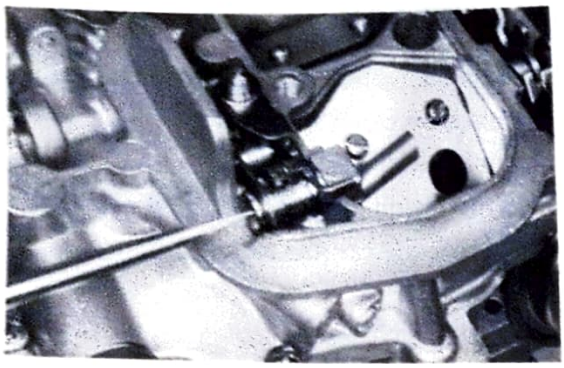
NOTE: To conform with regulations, the idle mixture adjusting screw is adjusted and plugged with a steel plug by the manufacturer. Normally, this steel plug should not be removed.

The following instructions are organized so that you work on only one component group at a time. This will help avoid confusion from similarlooking parts from different sub-assemblies being on your workbench at the same time.

(a) To facilitate reassembly, arrange parts in order.

(b) Be careful not to mix up or lose clips or springs.

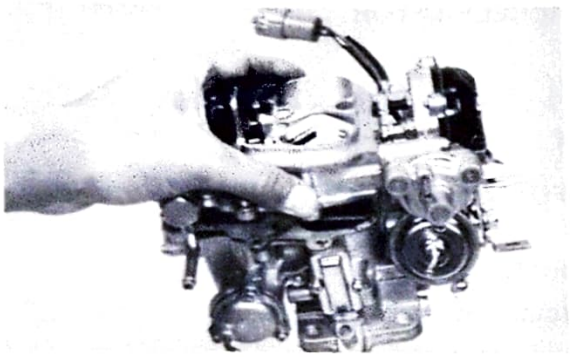
(c) Use carburetor driver set SST 09860-11011.



Disassembly of Air Horn

1. REMOVE METERING NEEDLE

Loosen the screw and remove the metering needle.

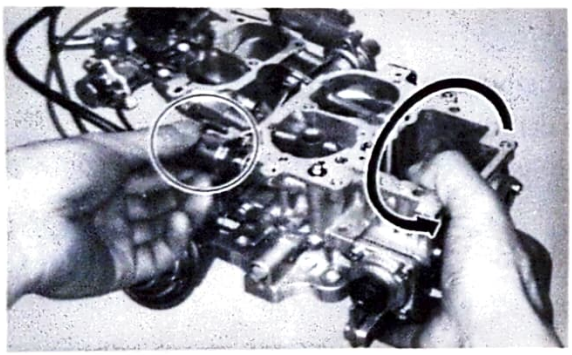


2. REMOVE AIR HORN ASSEMBLY

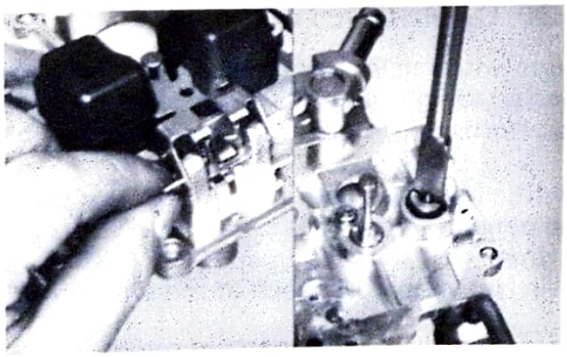
(a) Disconnect the fast idle link.

(b) Remove the five air horn screws and lift the air horn from the body

NOTE: Place the air horn next to the body.



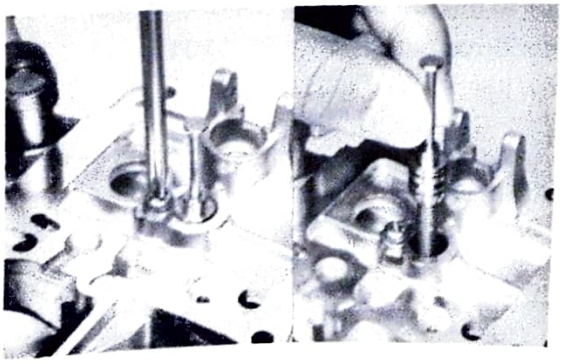
(c) Loosen the solenoid valve and remove it from the body by rotating the body counterclockwise.



3. REMOVE FLOAT AND NEEDLE VALVE

(a) Remove the pivot pin and float with the needle valve.

(b) Remove the needle valve seat.

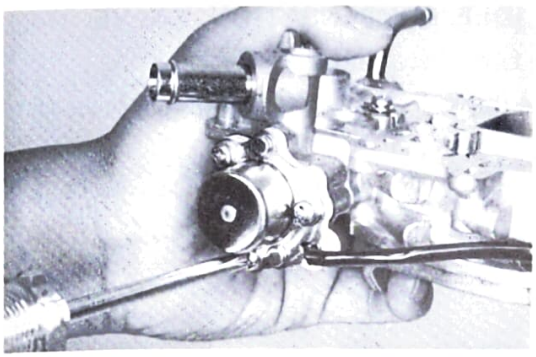


4. REMOVE POWER PISTON

(a) Loosen the retainer screw.

(b) While holding the piston, rotate the retainer.

(c) Remove the power piston and spring.

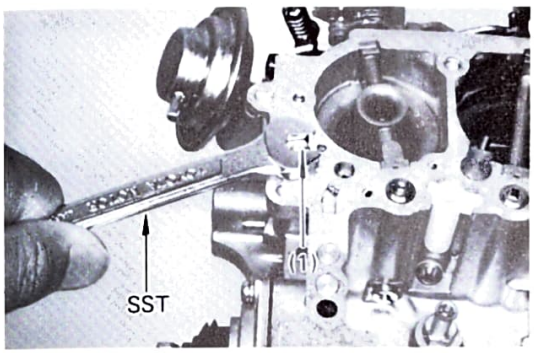


5. REMOVE OUTER VENT CONTROL VALVE

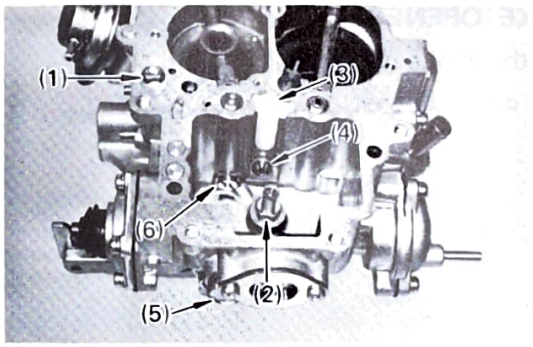
Remove the three screws, and outer vent control valve.

Disassembly of Carburetor Body

1. REMOVE JETS AND POWER VALVE



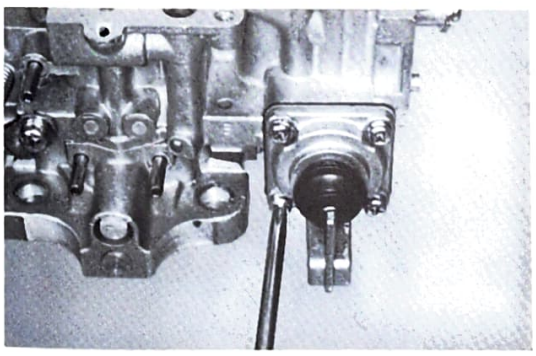
(a) Using a 5 mm wrench* remove the slow jet (1).
*SST 09922-00010 or Commercial tool



(b) Remove the power valve with jet (2).

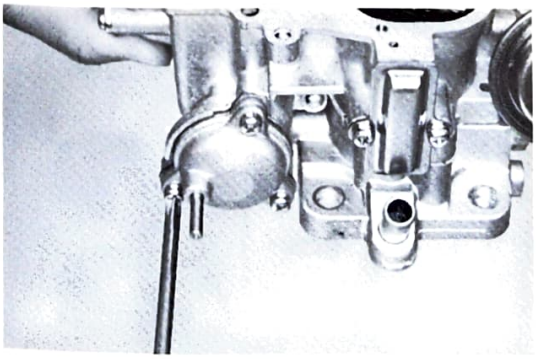
(c) Remove the metering needle guide (3), and secondary main jet (4).

(d) Remove the plug (5) and primary main jet (6).



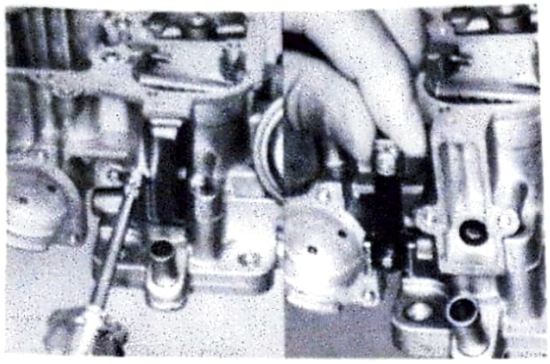
2. REMOVE ACCELERATION PUMP

Remove the four screws, pump housing, diaphragm and spring.

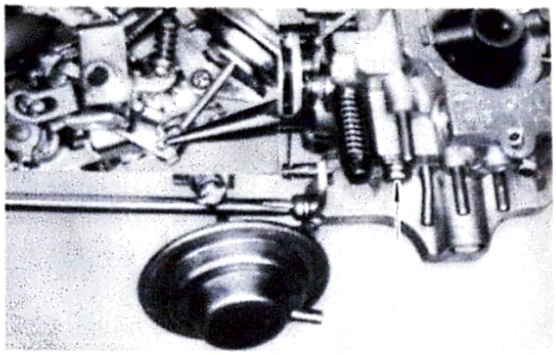


3. REMOVE AUXILIARY ACCELERATION PUMP

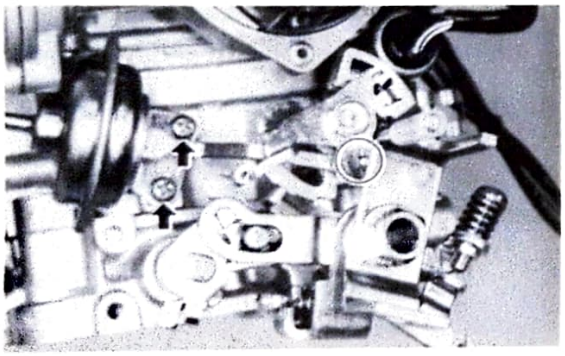
Remove the three screws, pump housing, spring and diaphragm.



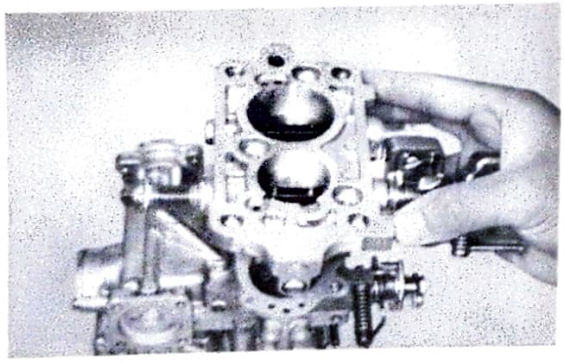
4. REMOVE HOT IDLE COMPENSATION VALVE
   (a) Remove the two screws and cover.
   (b) Take out the thermostatic valve and rubber valve seat.



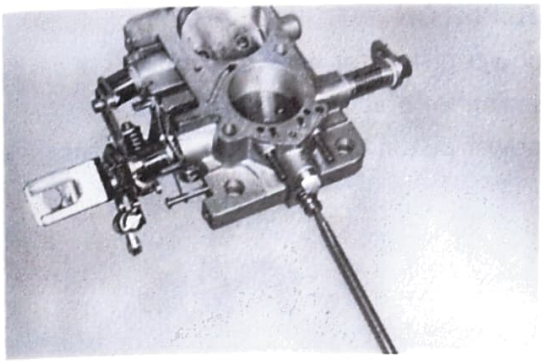
5. REMOVE IDLE-UP DIAPHRAGM
   (a) Disconnect the idle-up diaphragm link.
   (b) Remove the idle-up diaphragm.



6. REMOVE CHOKE OPENER
   (a) Disconnect the choke opener link.
   (b) Remove the choke opener.

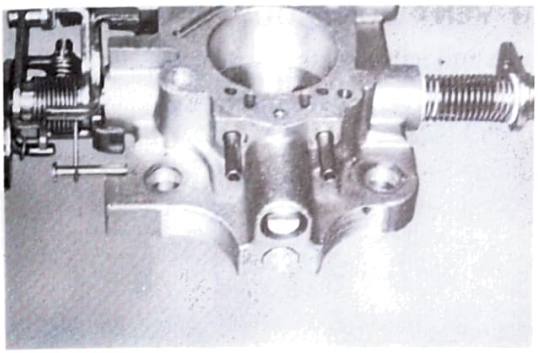


7. SEPARATE BODY AND FLANGE
   (a) Remove the three screws.
   (b) Separate the body and flange.



Disassembly of Carburetor Flange

REMOVE IDLE MIXTURE ADJUSTING SCREW
(Canada RN4x4)



NOTE: As stated on page 3-21, the idle mixture adjusting screw plug should normally not be removed. (Except Canada RN4x4)

GENERAL CLEANING PROCEDURE

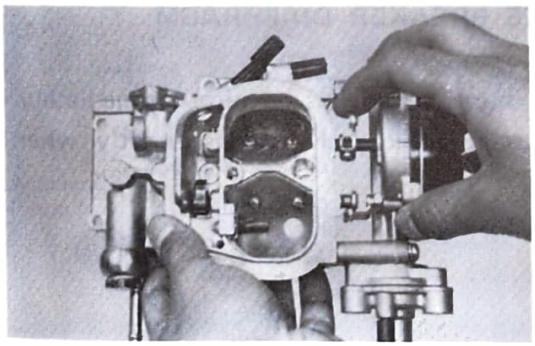
CLEAN DISASSEMBLED PARTS BEFORE INSPECTION

(a) Wash and clean the cast parts with a soft brush in carburetor cleaner.

(b) Clean off the carbon around the throttle valve.

(c) Wash the other parts thoroughly in carburetor cleaner.

(d) Blow all dirt and other foreign matter from the jets, fuel passages, and restrictions in the body.

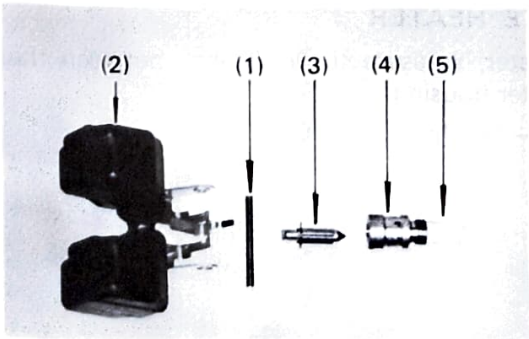


INSPECTION OF CARBURETOR

1. INSPECT AIR HORN

(a) Inspect the air horn for cracks or damage.

(b) Inspect the choke and air control valve shaft holes for excessive wear.



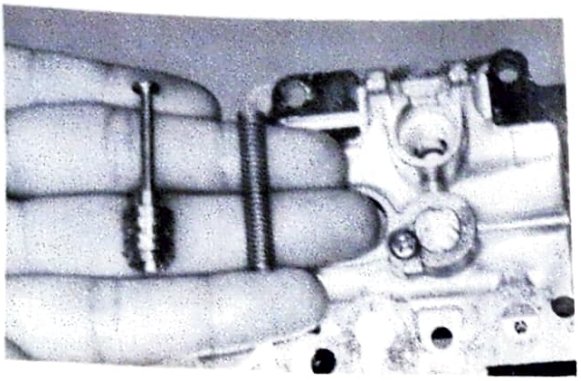
2. INSPECT FLOAT AND NEEDLE VALVE

(a) Inspect the pivot pin (1) for scratches or excessive wear.

(b) Inspect the float (2) for broken lips and wear in the pivot pin holes.

(c) Inspect the needle valve (3) and valve seat (4) for wear or damage.

(d) Inspect the strainer (5) for rust or breaks.

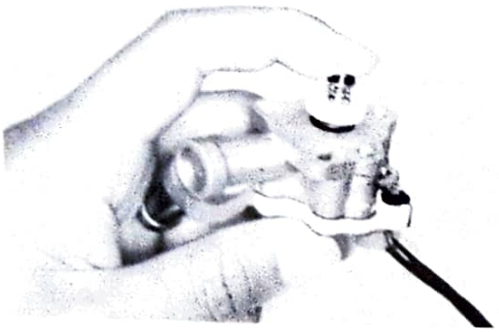


3. INSPECT POWER PISTON

(a) Inspect the power piston for wear or damage.

(b) Inspect the spring for breaks or deformation.

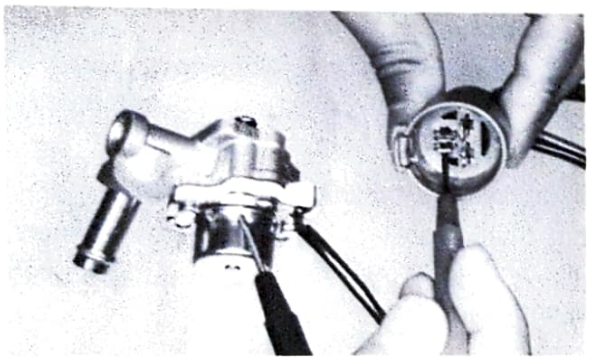
(c) Inspect the power piston bore for wear or damage.



4. INSPECT OUTER VENT CONTROL VALVE

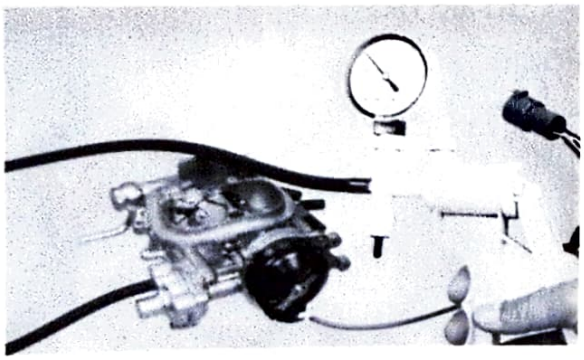
(a) Check the valve and valve seats for damage.

(b) Check that the valve rod moves smoothly.



(c) Using an ohmmeter, measure the resistance between the terminal and solenoid body.

Resistance: 63 – 73 ohms at 20°C (68°F)

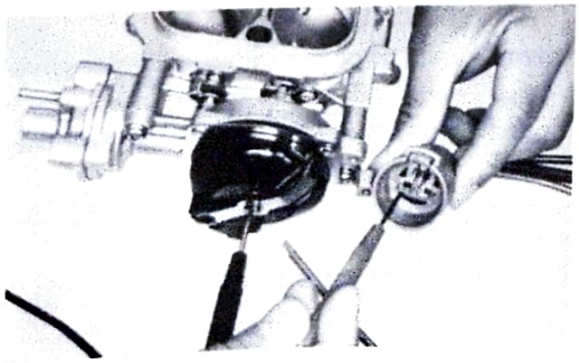


5. INSPECT CHOKE BREAKER DIAPHRAGM

(a) Apply vacuum to the diaphragm.

(b) Check that the vacuum does not drop immediately.

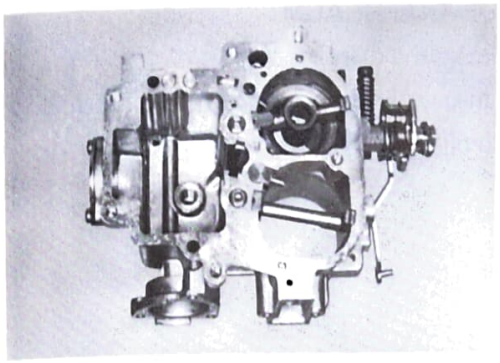
(c) Check that the choke valve opens slightly when vacuum is applied.



6. INSPECT CHOKE HEATER

Using an ohmmeter, measure the resistance between the terminal and heater housing.

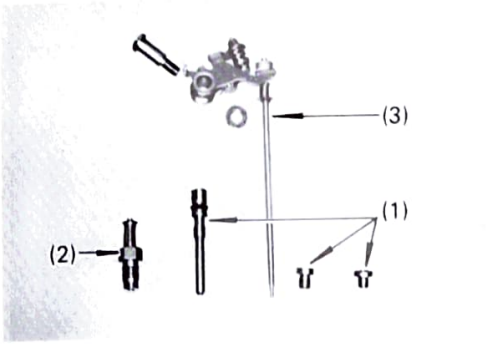
Resistance: 16 – 20 ohms at 20°C (68°F)



7. INSPECT CARBURETOR BODY

(a) Inspect the body for cracks and scored mounting surfaces.

(b) Inspect the threads for damage.

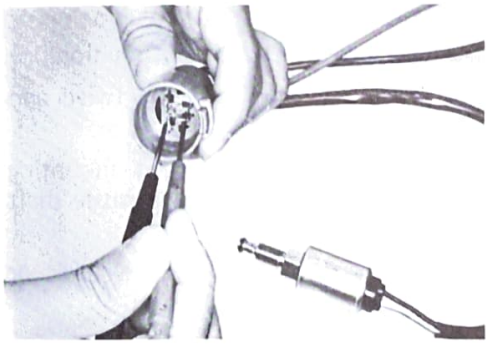


8. INSPECT JETS, POWER VALVE AND METERING NEEDLE

(a) Inspect the jets (1) for damaged contacting surfaces, threads and screwdriver slots.

(b) Inspect the power valve (2) for faulty opening and closing action, and for damaged contacting surfaces or threads.

(c) Inspect the metering needle (3) for bending or damage at the tapered tip.



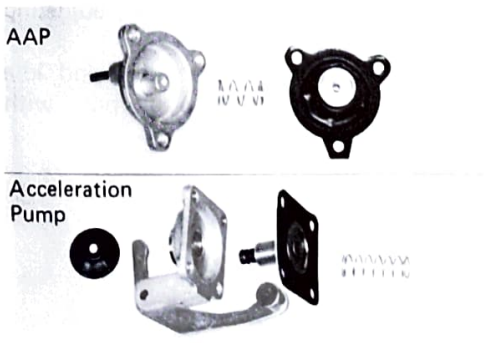
9. INSPECT PRIMARY FUEL CUT SOLENOID

(a) Inspect the O-ring for damage.

(b) Connect two terminals and battery terminals, as illustrated.

(c) You should feel a "click" from the solenoid valve when battery power is connected and disconnected.

If the solenoid valve is not operating properly, replace it.

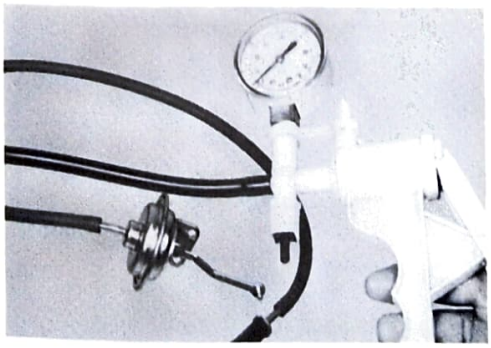


10. INSPECT AAP DIAPHRAGM AND ACCELERATION PUMP DIAPHRAGM

(a) Inspect the diaphragm for damage.

(b) Inspect the housing for cracks or damage.

(c) Inspect the spring for breaks or damage.

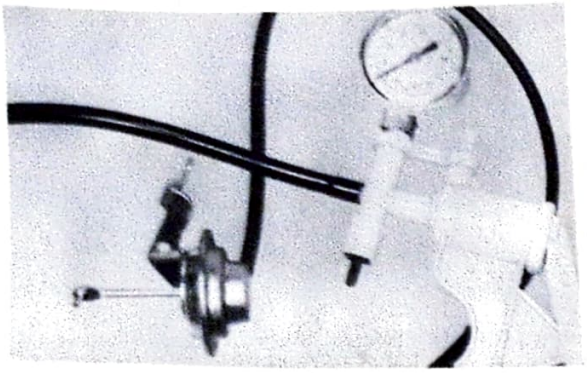


11. INSPECT CHOKE OPENER DIAPHRAGM

(a) Apply vacuum to the diaphragm.

(b) Check that the vacuum does not drop immediately.

(c) Check that the link moves when vacuum is applied.

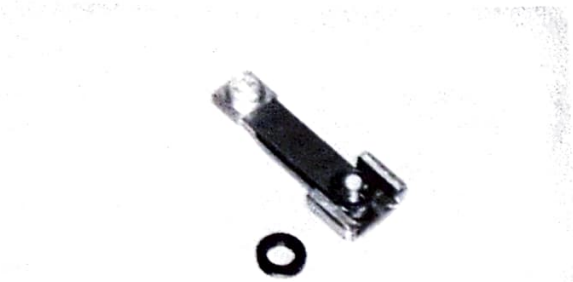


12. INSPECT IDLE-UP DIAPHRAGM

(a) Apply vacuum to the diaphragm.

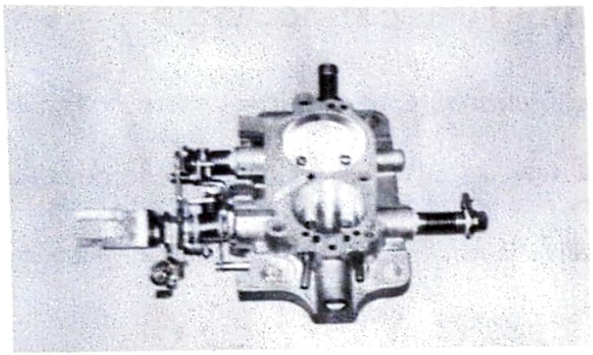
(b) Check that the vacuum does not drop immediately.

(c) Check that the link moves when vacuum is applied.



13. INSPECT HOT IDLE COMPENSATION VALVE

Visually check the hot idle compensation valve for damage.



14. INSPECT CARBURETOR FLANGE

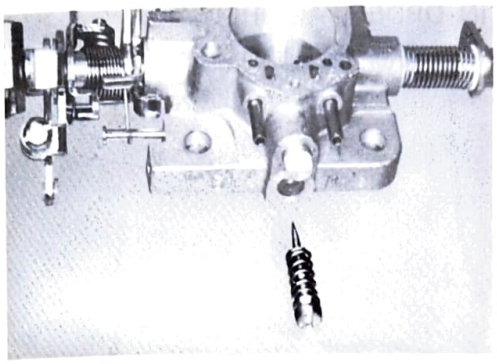
(a) Check the throttle valves for wear or deformation.

(b) Check the throttle shafts for wear, bends, twists and faulty movement.

(c) Check the flange for cracks, damaged mounting surfaces and threads, and wear at the throttle shaft bearings.

(d) Check the idle mixture adjusting screw (1) for damage at the tapered tip and threads.
(Canada RN 4x4)

NOTE: As stated on page 3-21, the idle mixture adjusting screw is plugged. (Except Canada RN 4x4)
If the slow port is clogged, remove the plug and idle mixture adjusting screw, and blow out the port with compressed air. (See page 3-111)



ASSEMBLY OF CARBURETOR

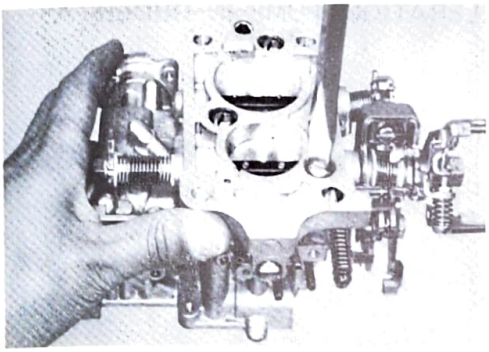
NOTE: Use new gaskets and O-rings throughout.

Assembly of Carburetor Flange

1. INSTALL IDLE MIXTURE ADJUSTING SCREW

Install the idle mixture adjusting screw temporarily. (Canada RN4x4)

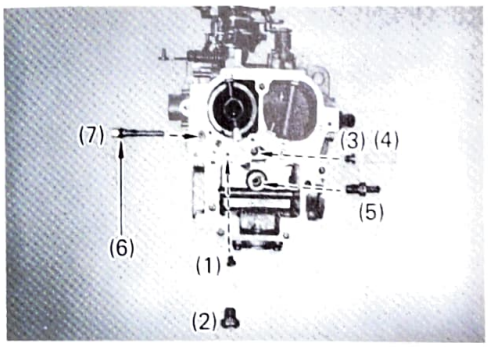
If the idle mixture adjusting screw has been removed, install it temporarily. (Except Canada RN4x4)



2. ASSEMBLE CARBURETOR BODY AND FLANGE

(a) Place the new gasket and body in position on the flange.

(b) Install the three screws.



Assembly of Carburetor Body

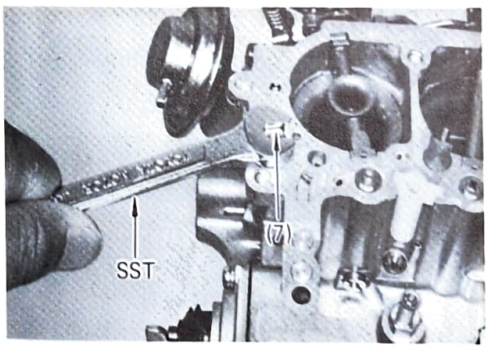
1. INSTALL MAIN JETS, SLOW JET AND POWER VALVE

(a) Install the primary main jet (1) over a new gasket.

(b) Install the plug (2) over a new gasket.

(c) Install the secondary main jet (3) and metering needle guide (4).

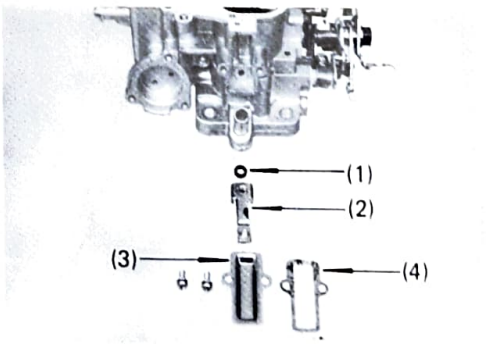
(d) Install the power valve with jet (5).



(e) Assemble a new O-ring (6) on the slow jet.

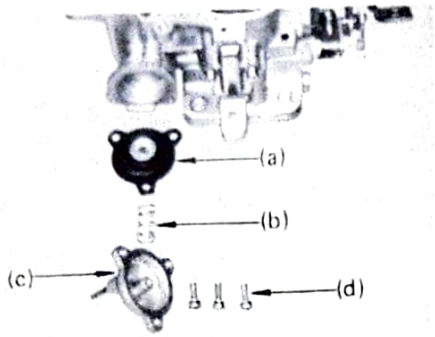
(f) Using a 5 mm wrench* install the slow jet (7).

*SST 09922-00010 or Commercial tool

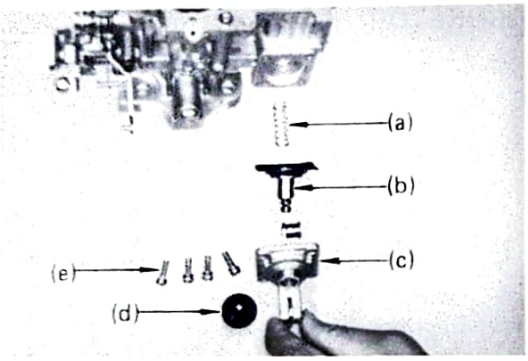


2. INSTALL HOT IDLE COMPENSATION VALVE

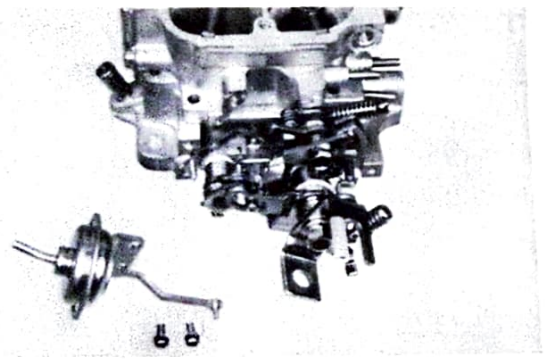
Install the valve seat (1), hot idle compensation valve (2) and cover (3) over a new gasket (4).



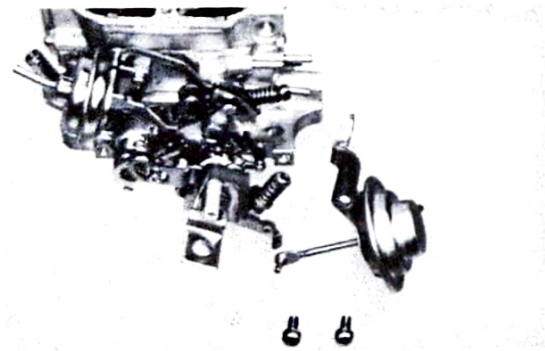
3. **INSTALL AAP IN ORDER, AS SHOWN:**
   (a) Diaphragm (with outer gasket)
   (b) Spring
   (c) Cover
   (d) Screws



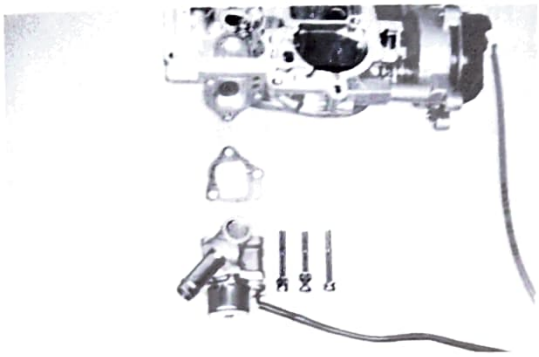
4. **INSTALL ACCELERATION PUMP IN ORDER, AS SHOWN:**
   (a) Spring
   (b) Diaphragm (with outer gasket)
   (c) Cover
   (d) Boot
   (e) Screws



5. **INSTALL CHOKE OPENER**
   Install the choke opener, and connect the link.



6. **INSTALL IDLE-UP DIAPHRAGM**
   Install the idle-up diaphragm, and connect the link.

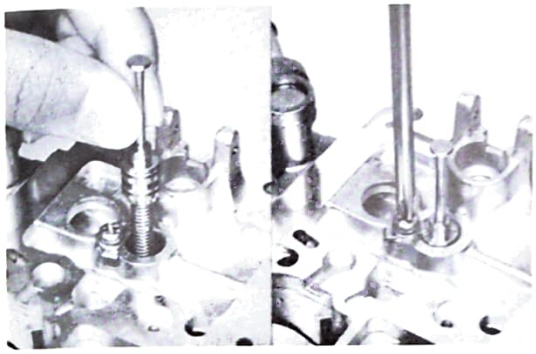


Assembly of Air Horn

1. INSTALL OUTER VENT CONTROL VALVE

(a) Place a new gasket in position on the air horn.

(b) Install the outer vent control valve on the air horn with the three screws.

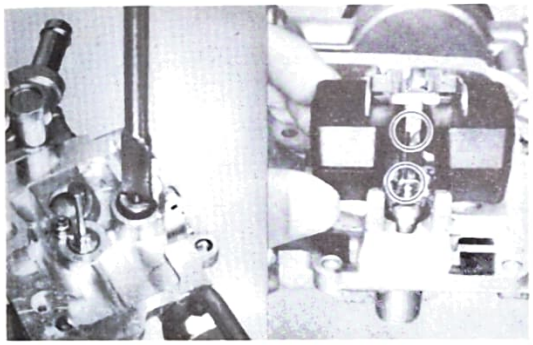


2. INSTALL POWER PISTON

(a) Place the power piston spring and piston into the bore.

(b) While pushing the piston, rotate the retainer over the piston.

(c) Tighten the retainer screw.



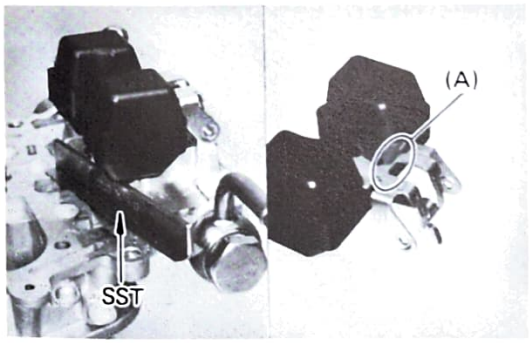
3. INSTALL FLOAT AND NEEDLE VALVE

(a) Install the valve seat over a new gasket into the fuel inlet.

(b) Install the needle valve onto the valve seat.

(c) Insert the lip of the float under the wire of the needle valve.

(d) Install the float and secure it with the pivot pin.



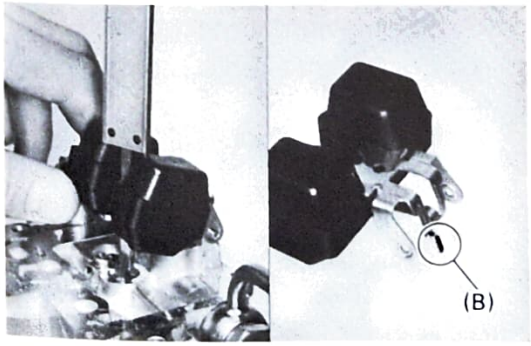
4. ADJUST FLOAT LEVEL

(a) Allow the float to hang down by its own weight.
Using a float gauge*, check the clearance between the float top and air horn.

* SST 09240-00014

Float level (raised position): 10.5 mm (0.413 in.)

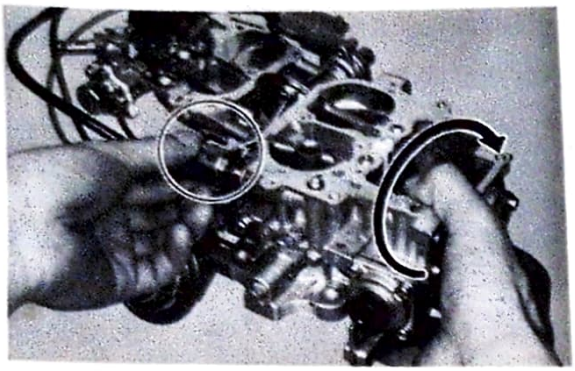
(b) Adjust by bending the (A) part of the float.



(c) Lift up the float with your finger.
Using vernier calipers*, check the distance between the float bottom and air horn.

Float level (lowered position): 48 mm (1.89 in.)

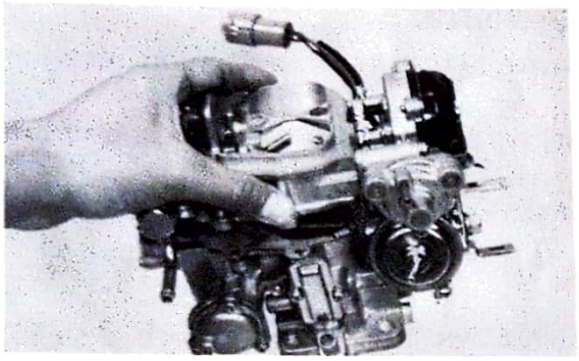
(d) Adjust by bending the (B) part of the float.



5. ASSEMBLE AIR HORN AND BODY

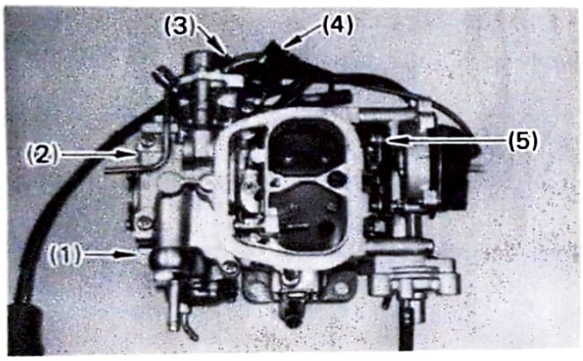
(a) Assemble the new O-ring on the solenoid valve.

(b) Install the solenoid valve into the carburetor body by rotating the carburetor body clockwise.



(c) Put a new gasket on the body.

(d) Carefully assemble the air horn and body.



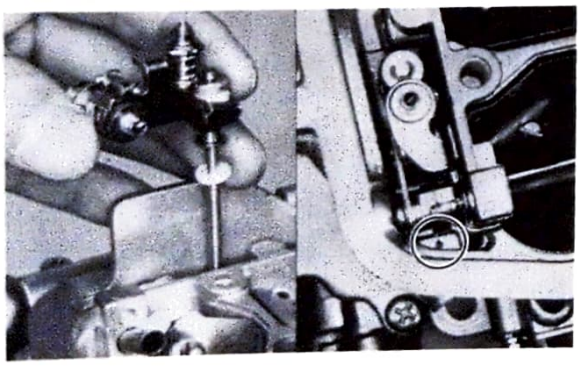
6. INSTALL FIVE SCREWS WITH OTHER PARTS, AS FOLLOWS:

(a) Install the fuel inlet bracket (1).

(b) Install the number plate (2).

(c) Install the VCV clamp (3) and wire clamp (4).

(d) Connect the fast idle link (5).

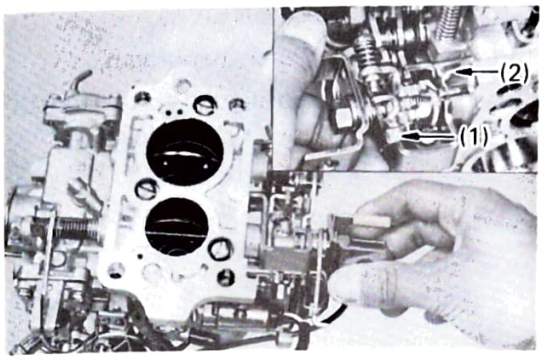


7. INSTALL METERING NEEDLE

(a) Insert the metering needle into the air horn with the collar.

(b) Hook the spring end into the hole.

(c) Tighten the screw with two washers.



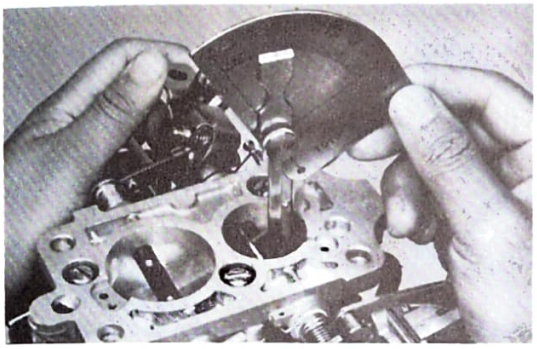
ADJUSTMENT OF CARBURETOR

NOTE: Use SST 09240-00014 to make adjustment.

1. CHECK AND ADJUST THROTTLE VALVE OPENING

Check the full opening angle of the primary and secondary throttle valves.
Adjust by bending the respective first throttle arm levers for the primary (1) and secondary (2).

Standard angle:
Primary – 90° from horizontal plane
Secondary – 90° from horizontal plane

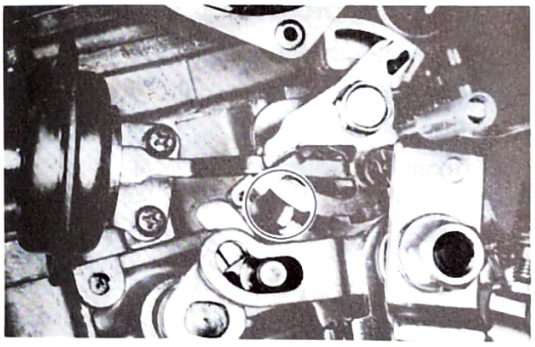


2. CHECK SECONDARY TOUCH ANGLE

Check the first throttle valve opening at the same time the second throttle valve just starts to open.

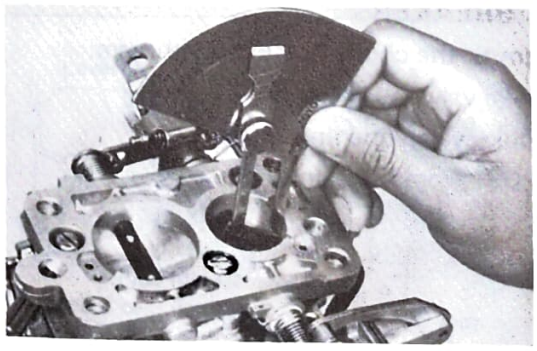
Standard angle: 59° from horizontal plane

NOTE: It is not necessary to adjust the secondary touch angle.



3. CHECK AND ADJUST FAST IDLE SETTING

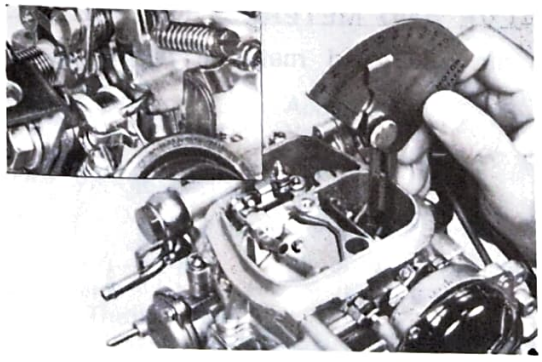
(a) Set the throttle shaft lever to the first step of the fast idle cam as shown.



(b) With the choke valve fully closed, check the first throttle valve angle.

Adjust by turning the fast idle adjusting screw.

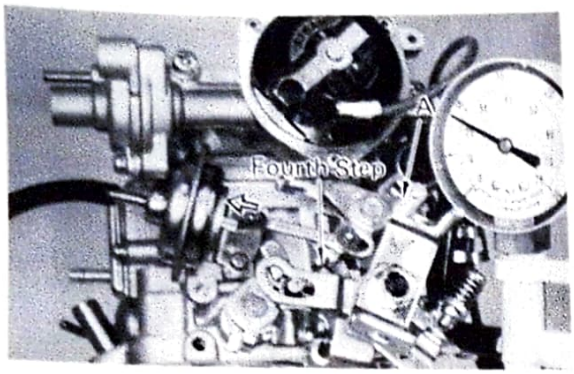
Standard angle: 24° from horizontal plane



4. CHECK AND ADJUST UNLOADER

With the primary throttle valve fully opened, check the choke valve angle. Adjust by bending the first throttle arm.

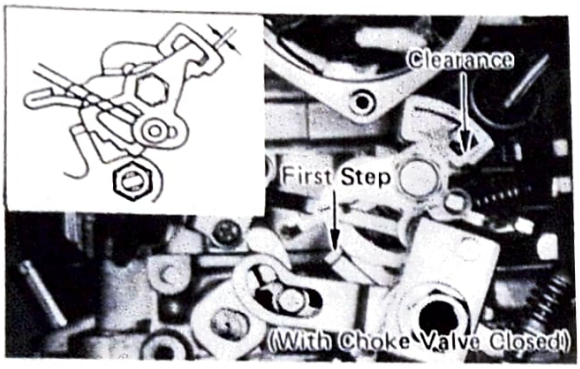
Standard angle:
Canada RN 4x4 – 50° from horizontal plane
Others – 45° from horizontal plane



5. CHECK AND ADJUST CHOKE OPENER

(a) Apply vacuum to the choke opener diaphragm.

(b) Check that the fast idle cam is released to the fourth step. Adjust by bending the choke opener lever A.

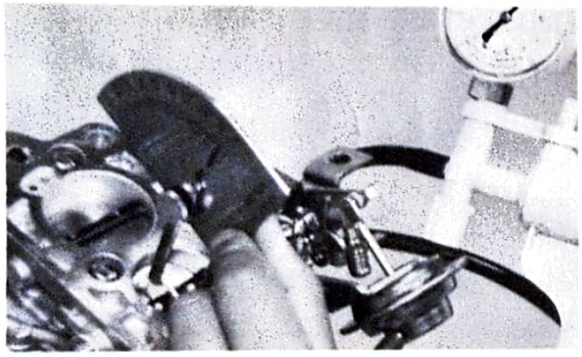


(c) Disconnect the vacuum gauge.

(d) Close the choke valve and set the fast idle lever to the first step.

(e) Check that there is clearance between the choke opener lever and fast idle cam.

Standard Clearance: about 1 mm (0.04 in.)

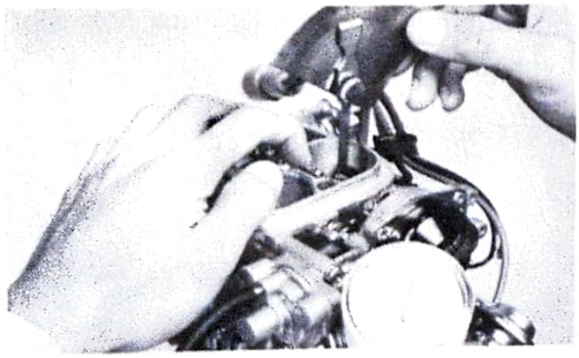


6. CHECK AND ADJUST IDLE-UP

(a) Apply vacuum to the idle-up diaphragm.

(b) Check the throttle valve opening angle. Adjust by turning the adjusting screw.

Standard angle: 38° from horizontal plane



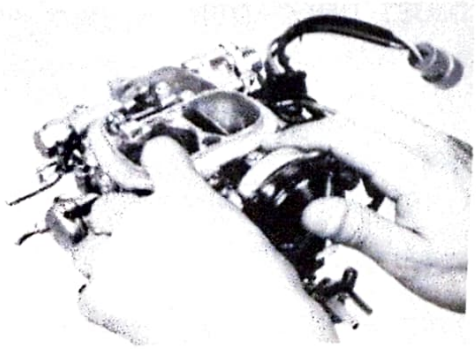
7. CHECK CHOKE BREAKER

(a) Apply vacuum to the choke breaker diaphragm.

(b) Close the choke valve by hand.

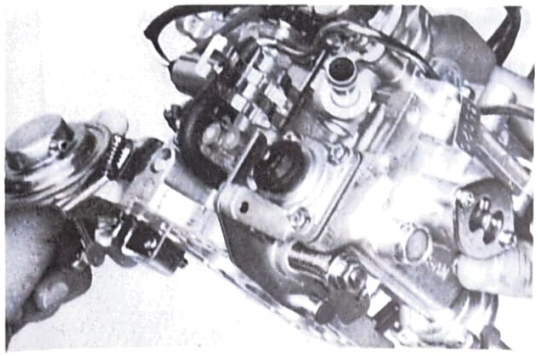
(c) Check the choke valve opening angle.

Standard angle: 38° from horizontal plane



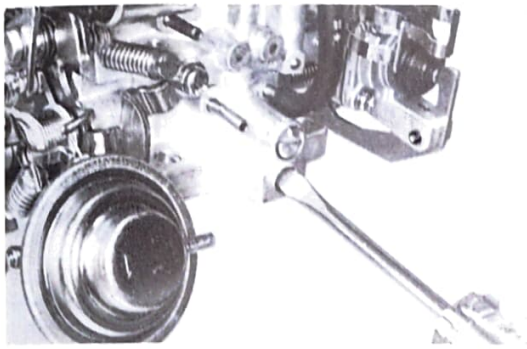
8. CHECK AIR VALVE AND METERING NEEDLE

Check that the air valve and metering needle move smoothly together.



9. CHECK ACCELERATION PUMP

Rotate the throttle shaft and check that the pump lever and diaphragm rod move smoothly.



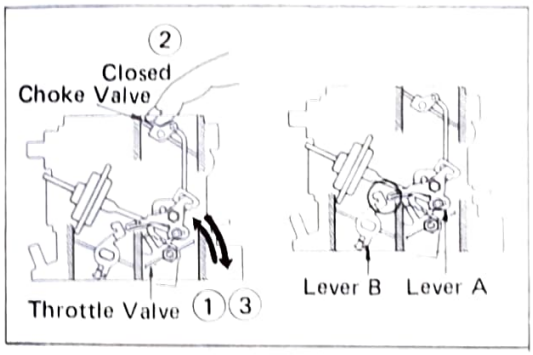
10. PRESET IDLE MIXTURE ADJUSTING SCREW

Screw in the idle mixture adjusting screw and then unscrew it the following amount. (Canada RN4x4)

Standard: Return 2-1/2 turns from fully closed

CAUTION: Use care not to screw in too tightly and damage the screw tip.

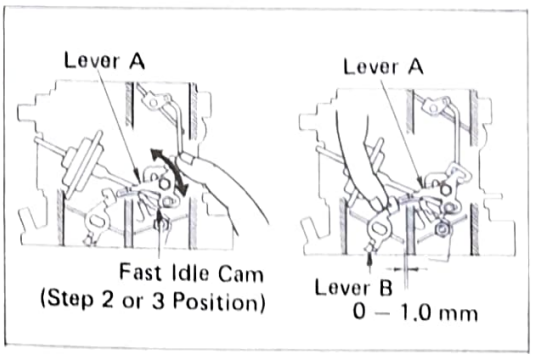
If the idle mixture adjusting screw plug has been removed, preset the idle mixture adjusting screw in the manner described above. (Except Canada RN4x4)



11. INSPECT AND ADJUST SECONDARY THROTTLE VALVE LOCK SYSTEM

(a) While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

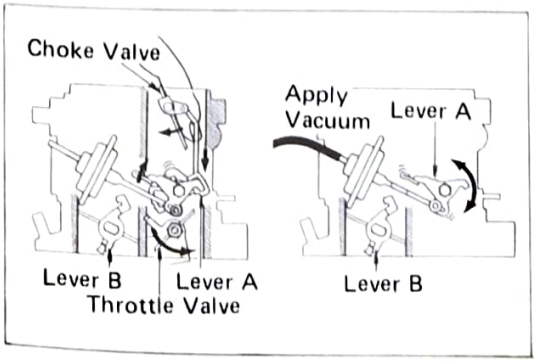
(b) In condition (a) check that lever A is holding lever B locked as shown.



(c) Check that the lever A moves smoothly.
Adjust by bending the top of lever A.

(d) In condition (a), rotate lever B to where it makes contact with lever A. In this position, measure the clearance between the secondary valve and bore. Adjust by bending the top of lever A.

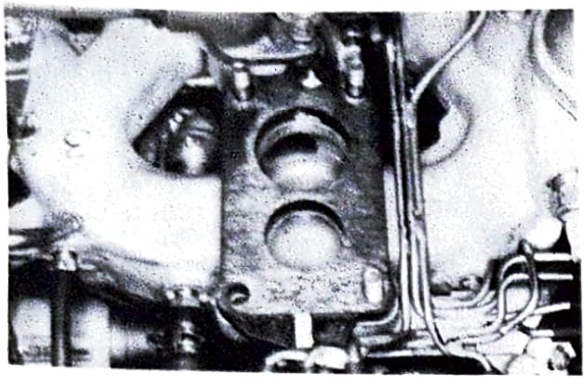
Standard clearance: 0 – 1.0 mm (0 – 0.039 in.)



(e) With the choke valve opened (above 40°), check that the lever A unlocks when the throttle valve is opened.

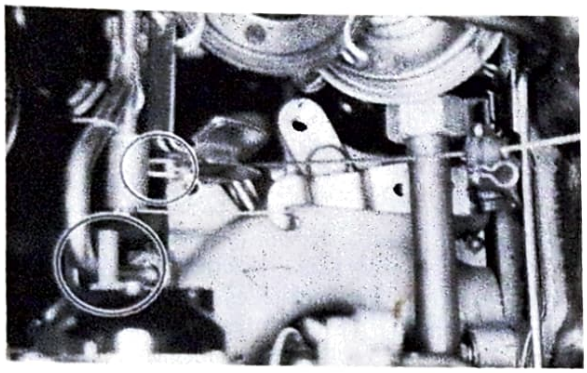
(f) Repeat step (a).

(g) Apply vacuum to the choke opener and check that lever A withdraws and that lever B unlocks.

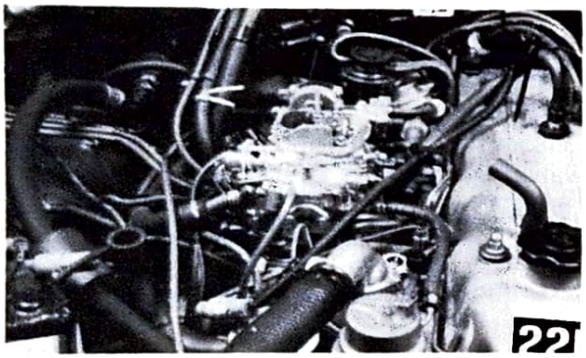


INSTALLATION OF CARBURETOR

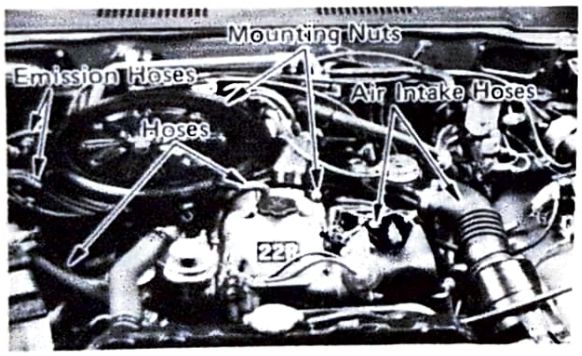
1. INSTALL CARBURETOR
   (a) Place the insulator on the intake manifold.
   (b) Install the carburetor. Tighten the bolts and nuts securely.



2. CONNECT ACCELERATOR LINKAGE
3. CONNECT THROTTLE CABLE FOR AUTOMATIC TRANSMISSION



4. CONNECT FOLLOWING HOSES TO CARBURETOR:
   (a) Fuel inlet hose
   (b) PCV hose
   (c) Emission control hoses (see system layout in the emission control section or the layout printed under the hood)



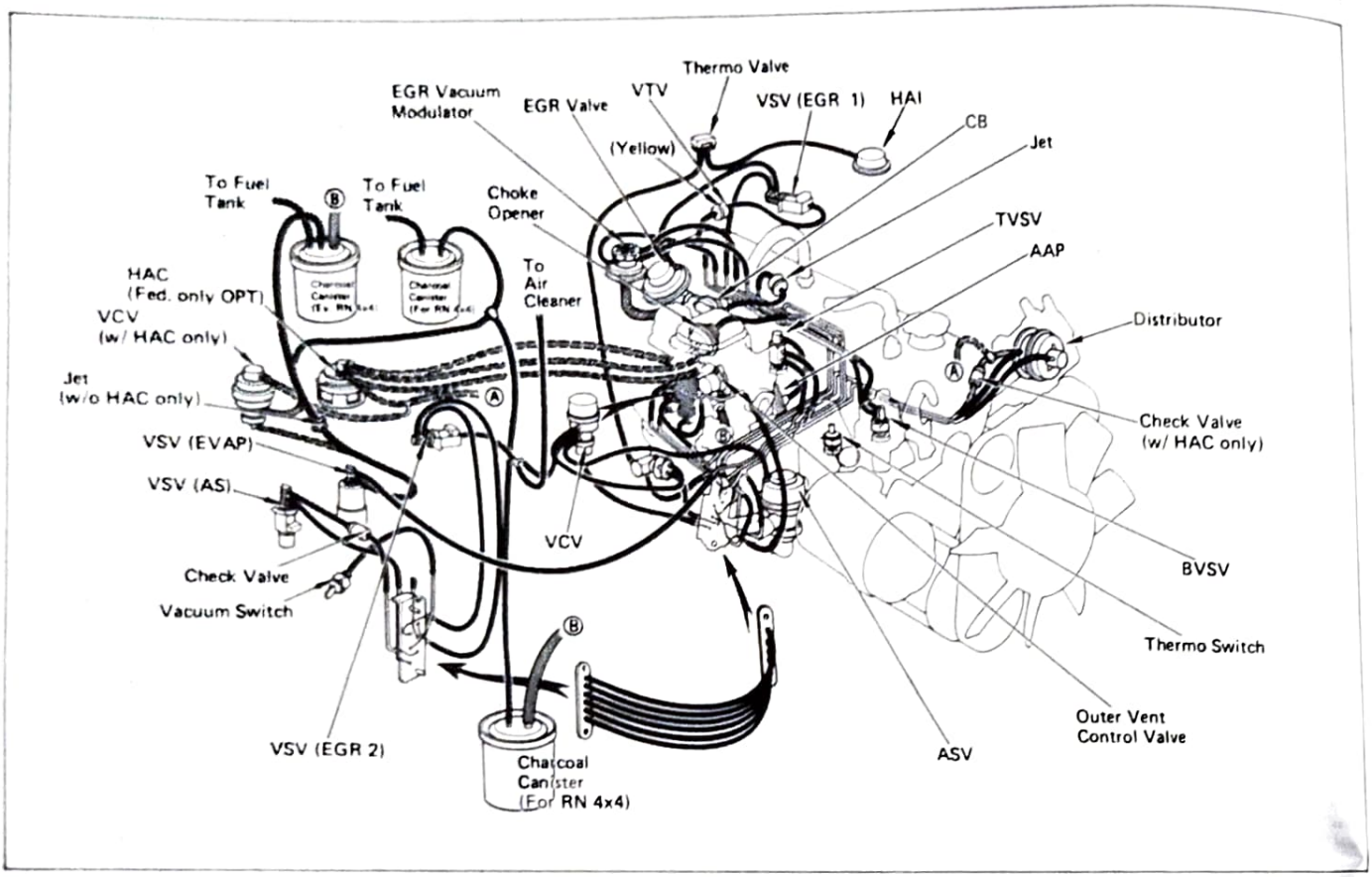
5. INSTALL AIR CLEANER
   (a) Place the air cleaner in position and install the two mounting nuts and butterfly nut.
   (b) Connect the air intake hoses.
   (c) Connect the emission control hoses.
6. ADJUST ENGINE RPM *(See page 3-106)*

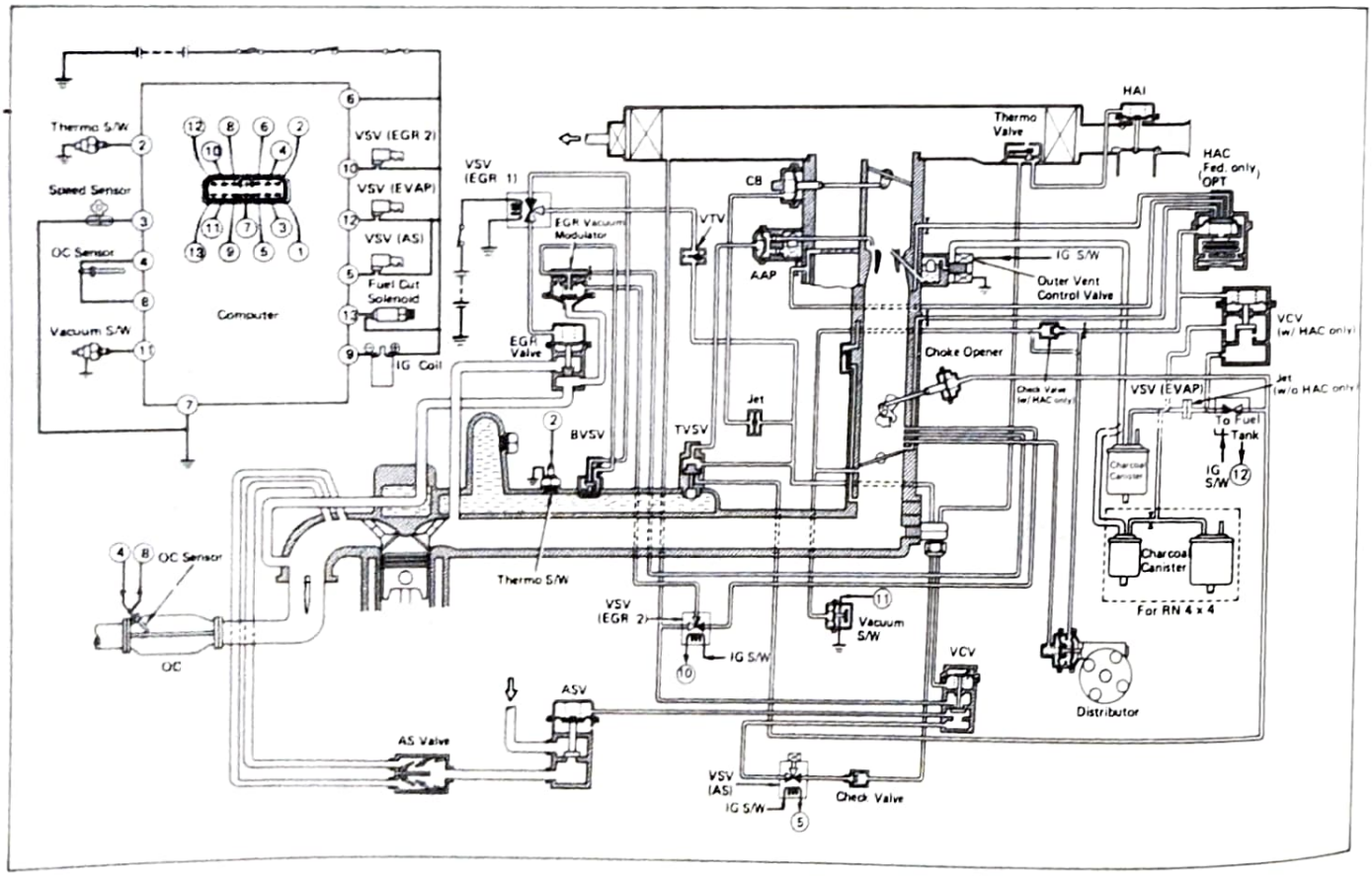
EMISSION CONTROL SYSTEMS
System Purpose

System	Abbre-viation	Purpose	Federal		California		Canada		RN C&C
			RN 4x2 (Ex. C&C)	RN 4x4	RN 4x2 (Ex. C&C)	RN 4x4	RN 4x2 (Ex. C&C)	RN 4x4	
Positive crankcase ventilation	PCV	Reduces blow-by gas (HC)	●	●	●	●	●	●	●
Fuel evaporative emission control	EVAP	Reduces evaporative HC	●	●*1	●	●*1	●	●	●*1
Mixture control	MC	Reduces HC & CO	—	—	●*2	●	—	—	●
Spark control	SC	Reduces NOx & HC	—	—	●	●	—	—	●
Exhaust gas recirculation	EGR	Reduces NOx	●	●	●	●	—	—	●
Air injection with feedback	AI	Maintains air-fuel ratio for TWC and reduces HC, CO & NOx in TWC	—	—	●	●	—	—	●
Air suction	AS	Reduces HC & CO	●	●	—	—	—	—	●
Three-way catalyst	TWC	Reduces HC, CO & NOx	—	—	●	●	—	—	—
Oxidation catalyst	OC	Reduces HC & CO	●	●	—	—	—	—	—
High altitude compensation	HAC	Insures air-fuel mixture at high altitude	●	●	—	—	—	—	●
Auxiliary system:			(OPT)	(OPT)					
Automatic hot air intake	HAI	Improves driveability — cold	●	●	●	●	●	●	●
Automatic choke	—	Improves driveability — cold	●	●	●	●	●	●	●
Choke breaker	CB	Improves driveability — cold	●	●	●	●	●	●	●
Choke opener	—	Improves driveability — hot	●	●	●	●	●	●	●
Auxiliary acceleration pump	AAP	Improves driveability — cold	●	●	●	●	●	●	●
Deceleration fuel cut	—	Prevents overheating OC or TWC, and after burning	●	●	●	●	●	●	●
Idle advance	—	Improves fuel economy at idle	●	●	●	●	●	—	●

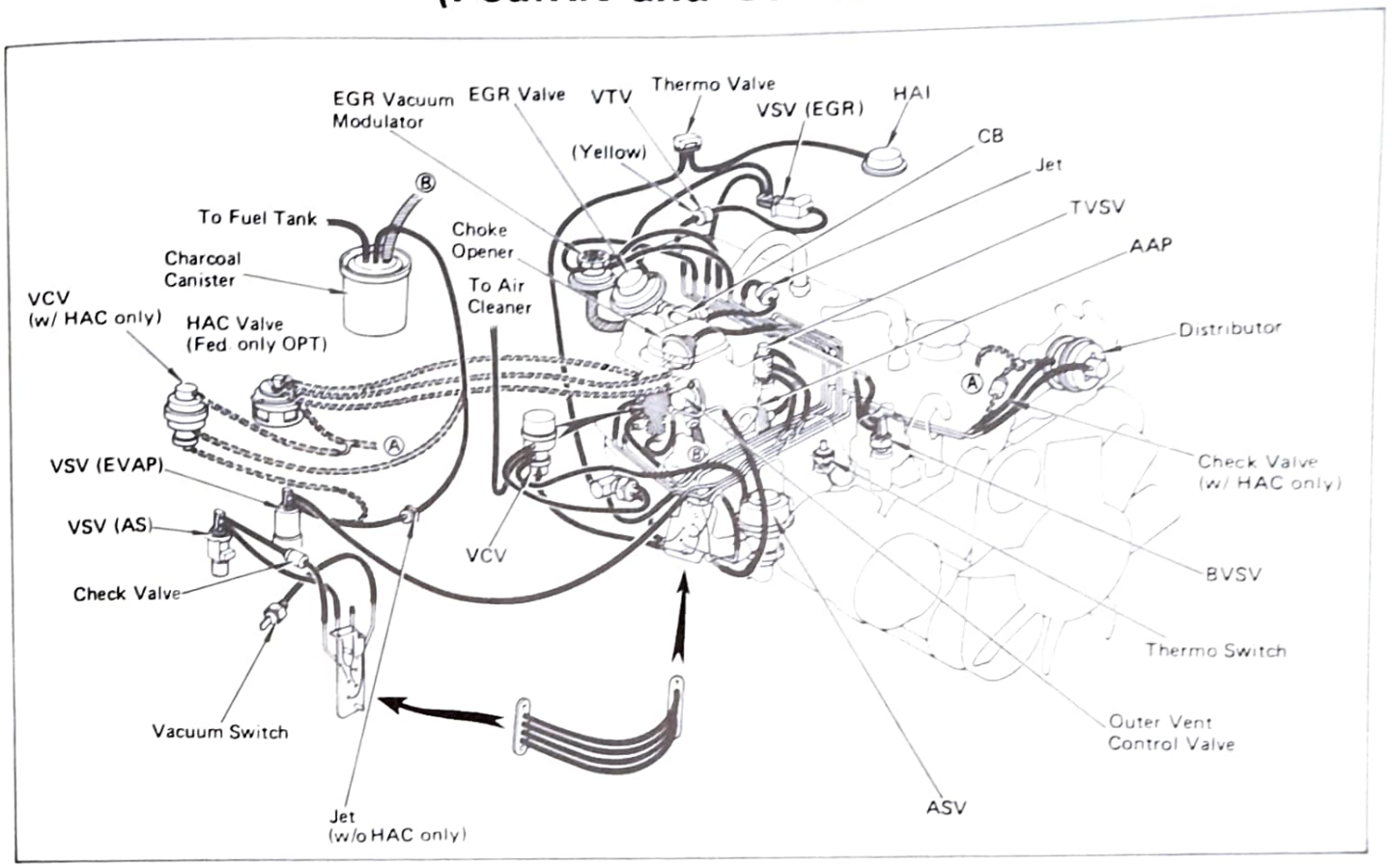
REMARKS: *1 Equipped with two canisters
*2 M/T vehicle only

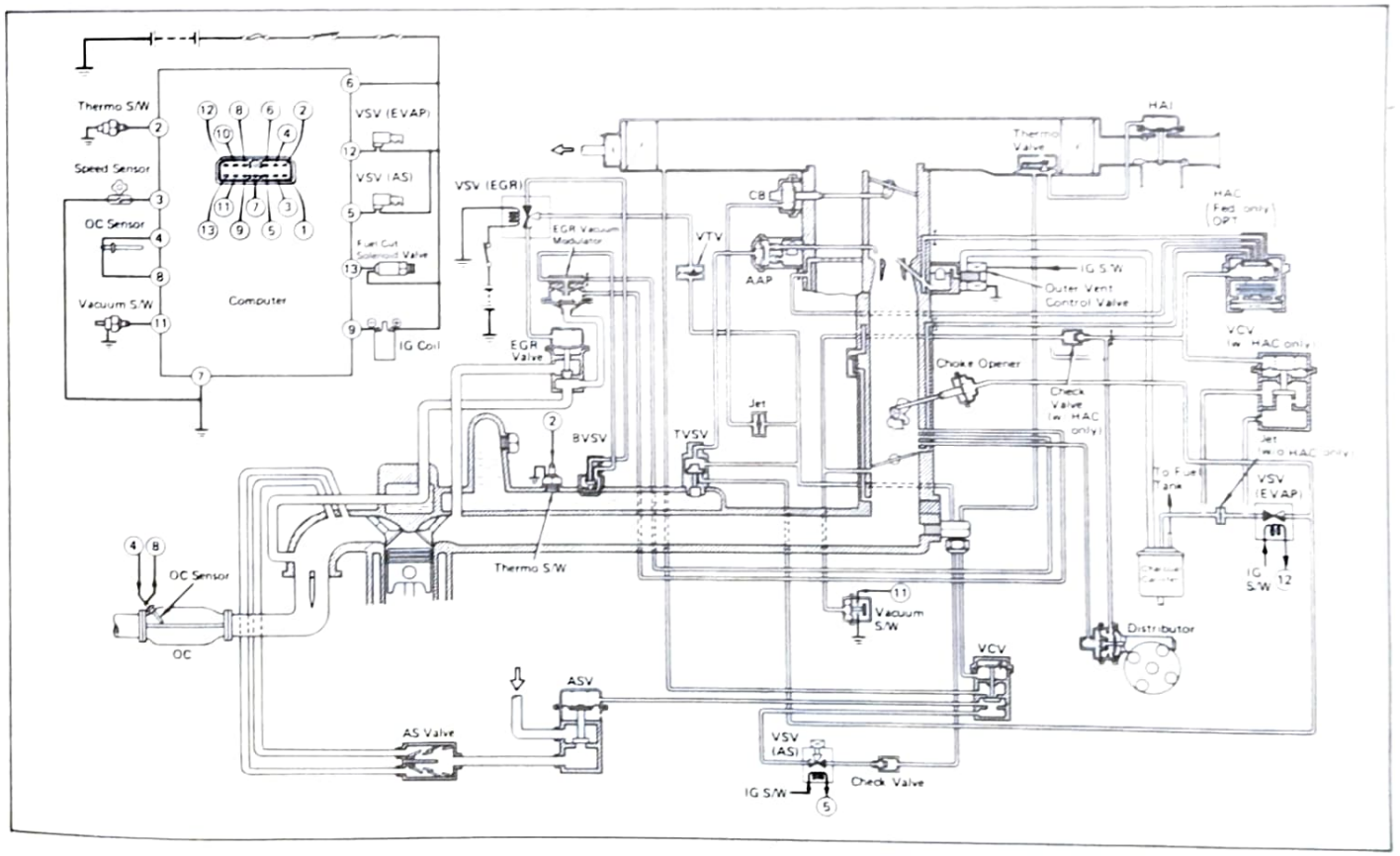
Component Layout and Schematic Drawing (Fed.RN and Canada RN 4 × 2 with M/T (Except C & C))



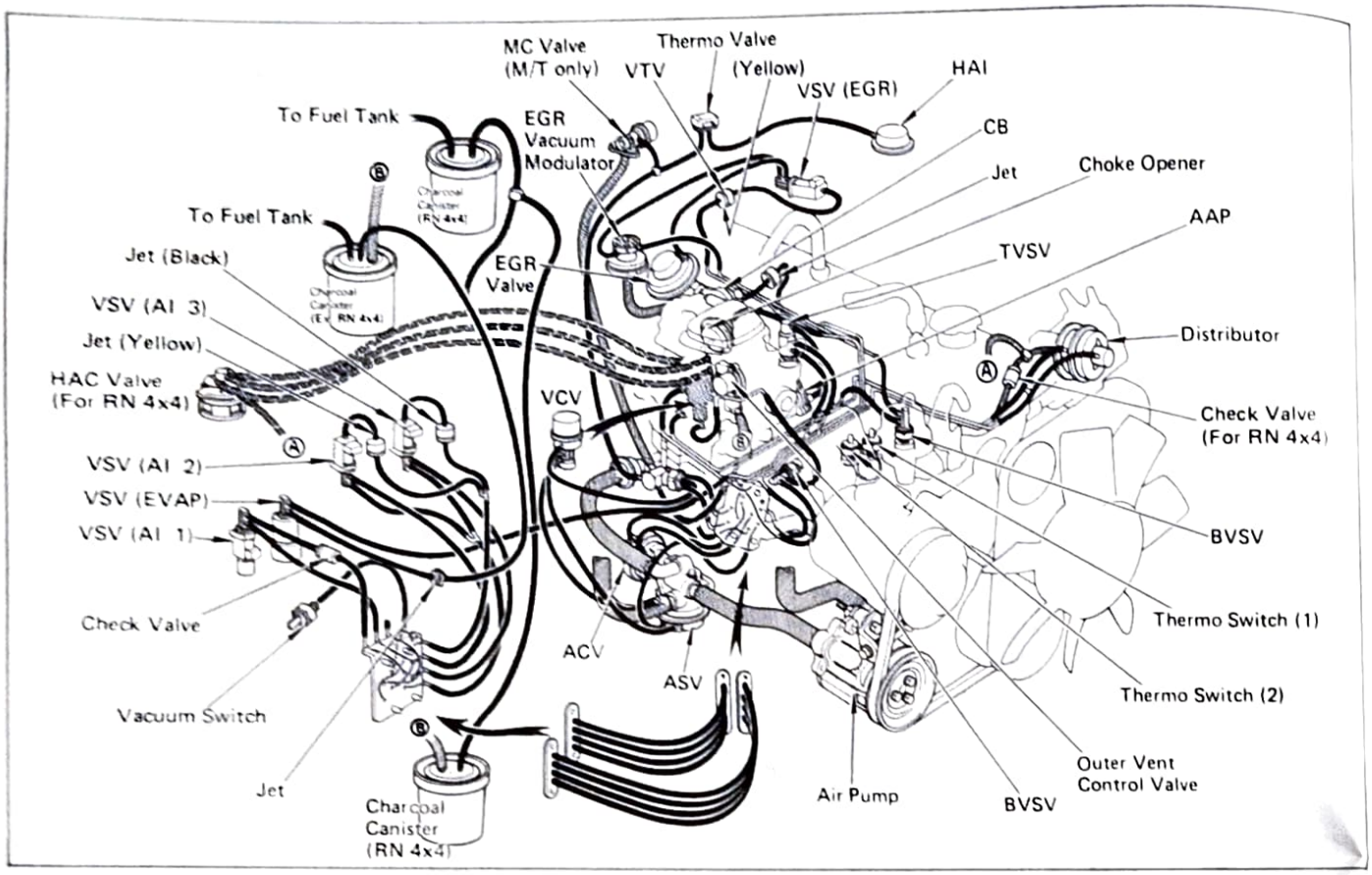


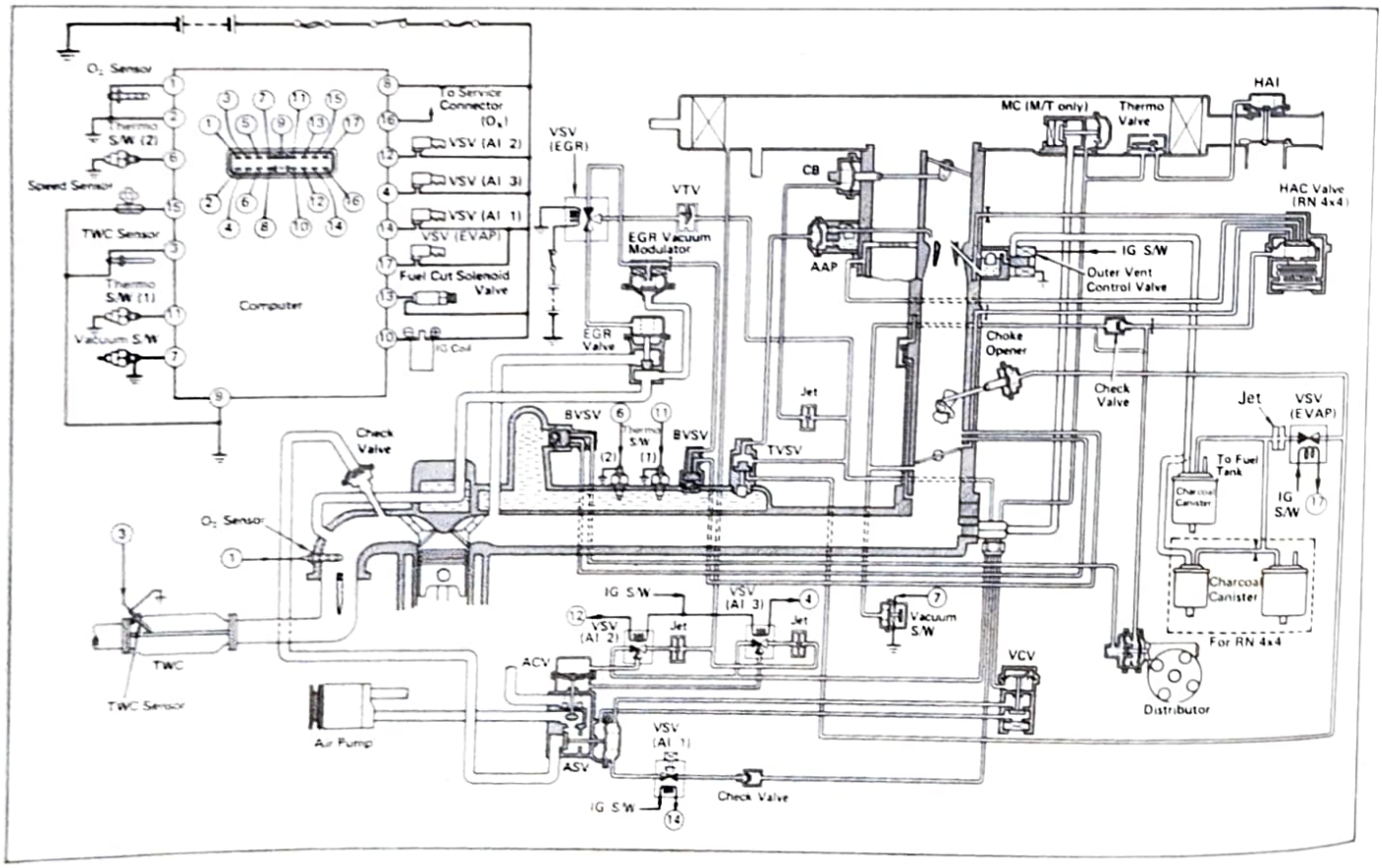
Component Layout and Schematic Drawing (Fed.RN and Canada RN 4 × 2 with A/T)



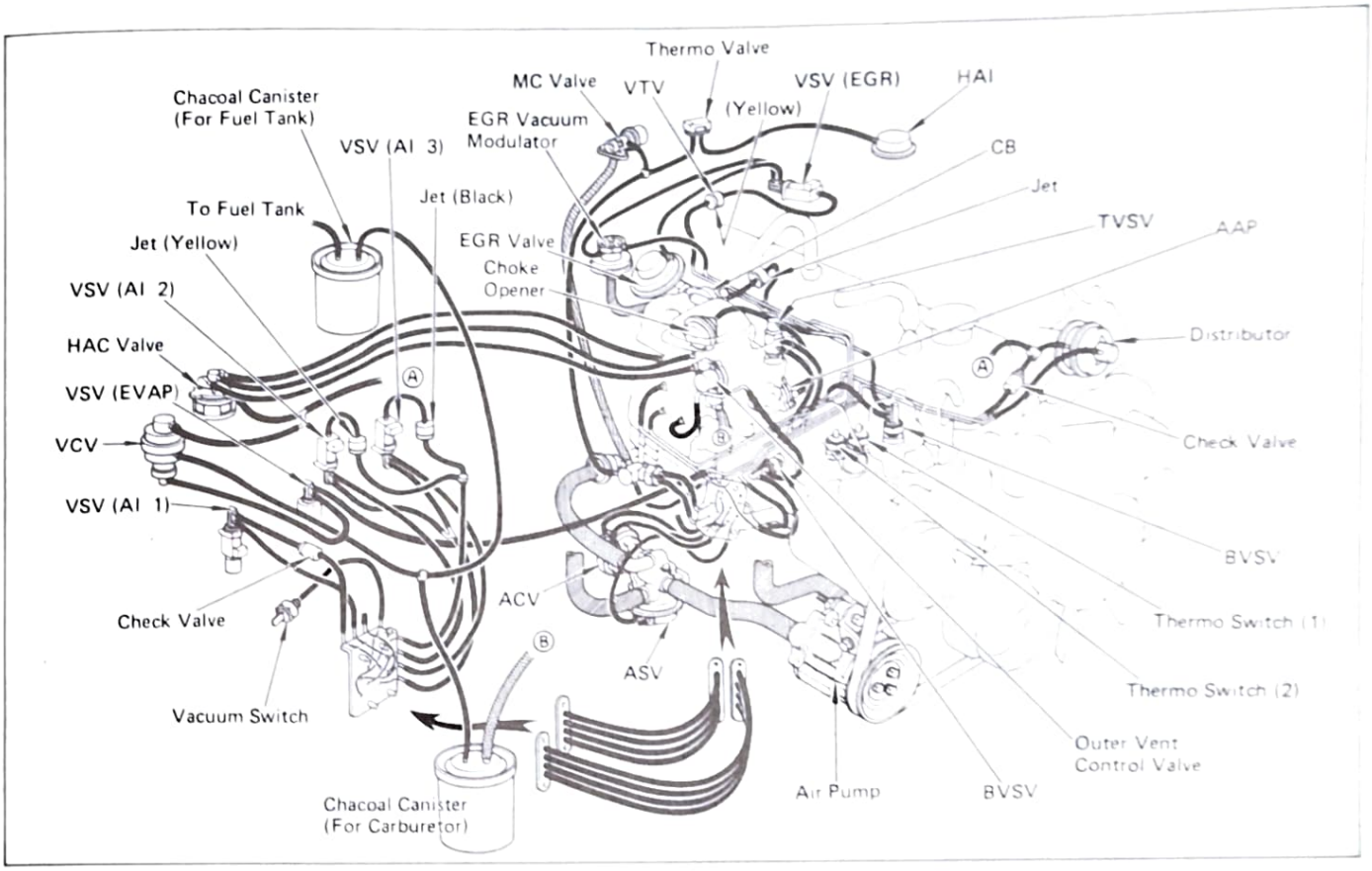


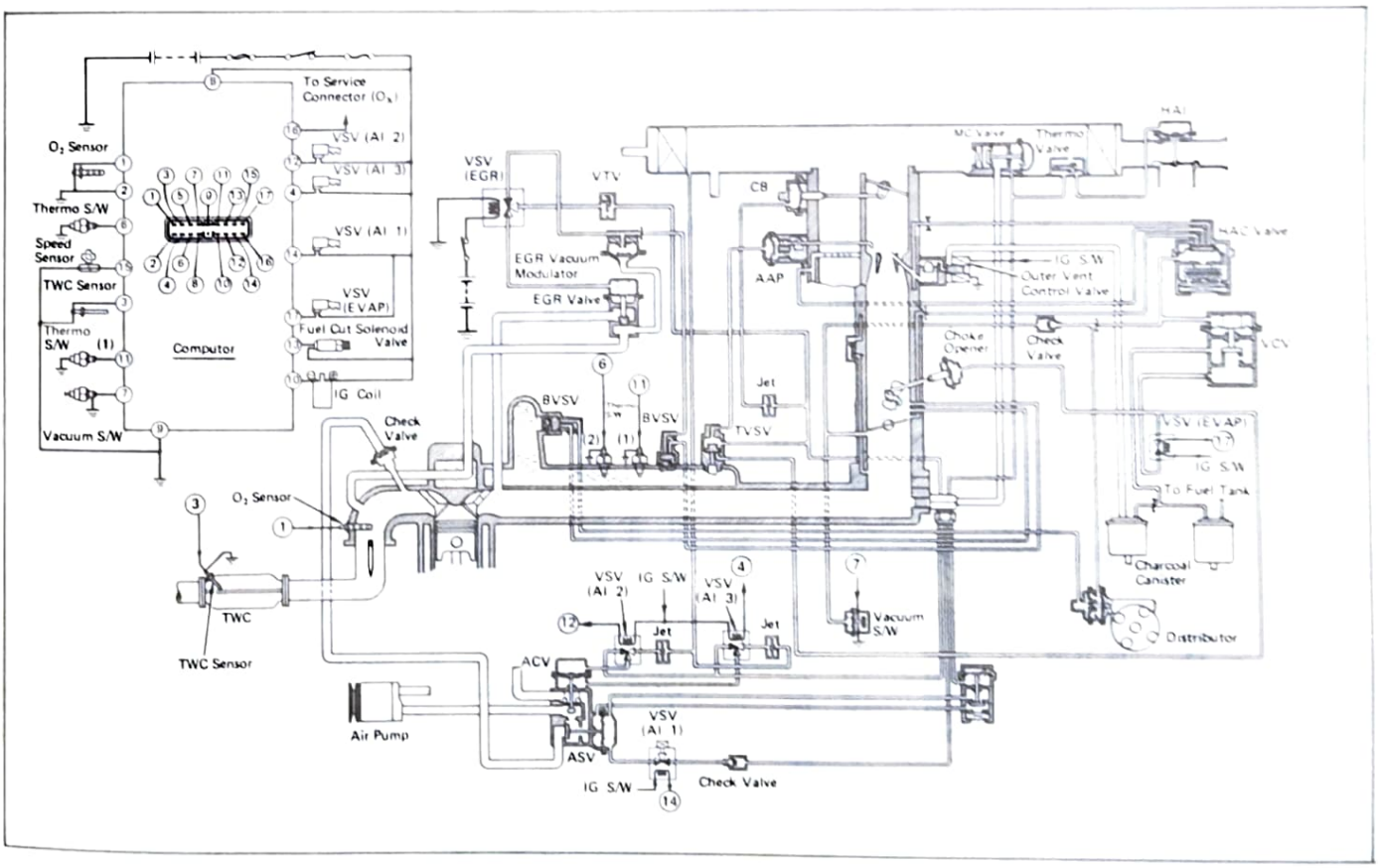
Component Layout and Schematic Drawing (Calif.Except C&C)



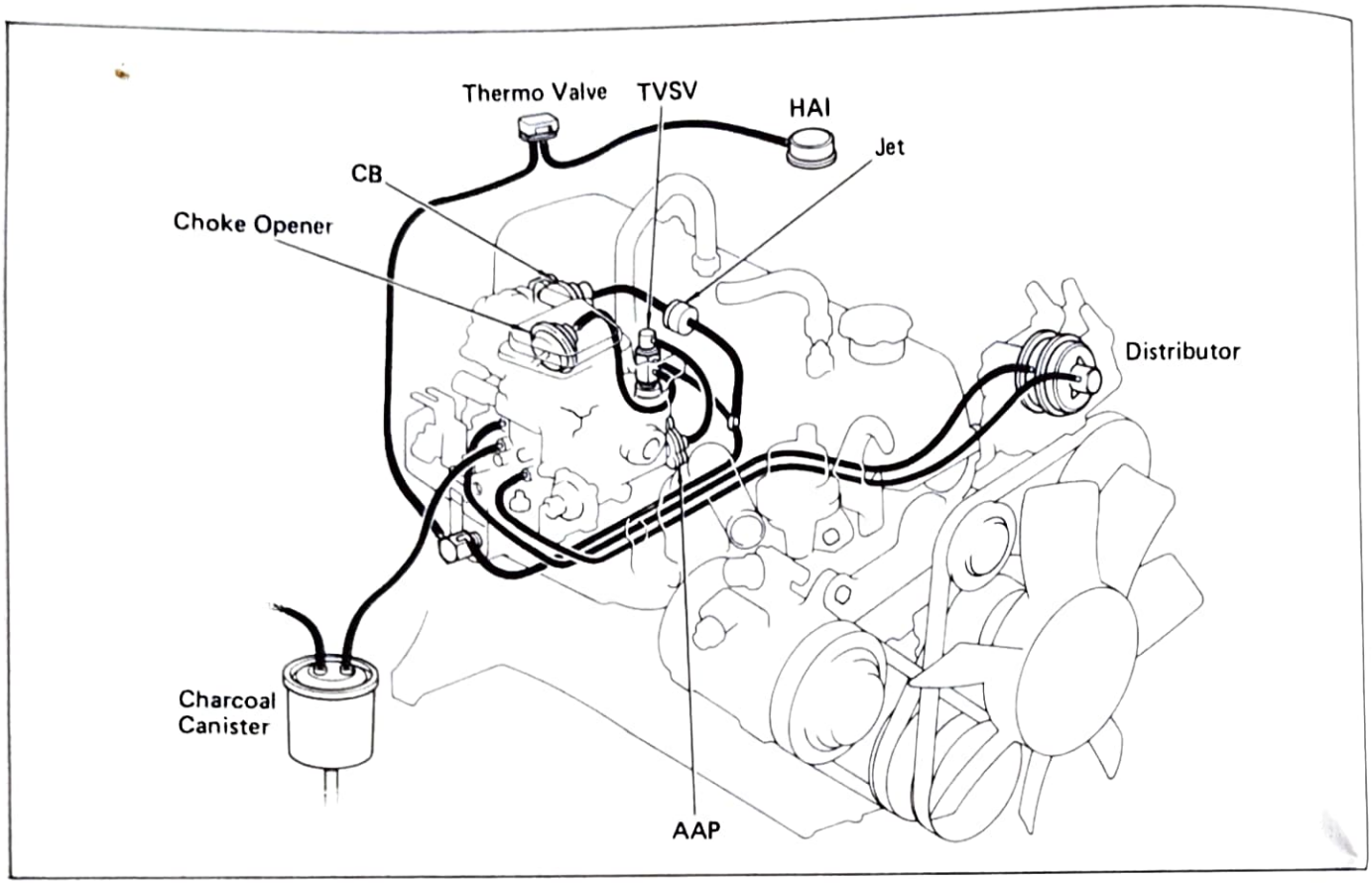


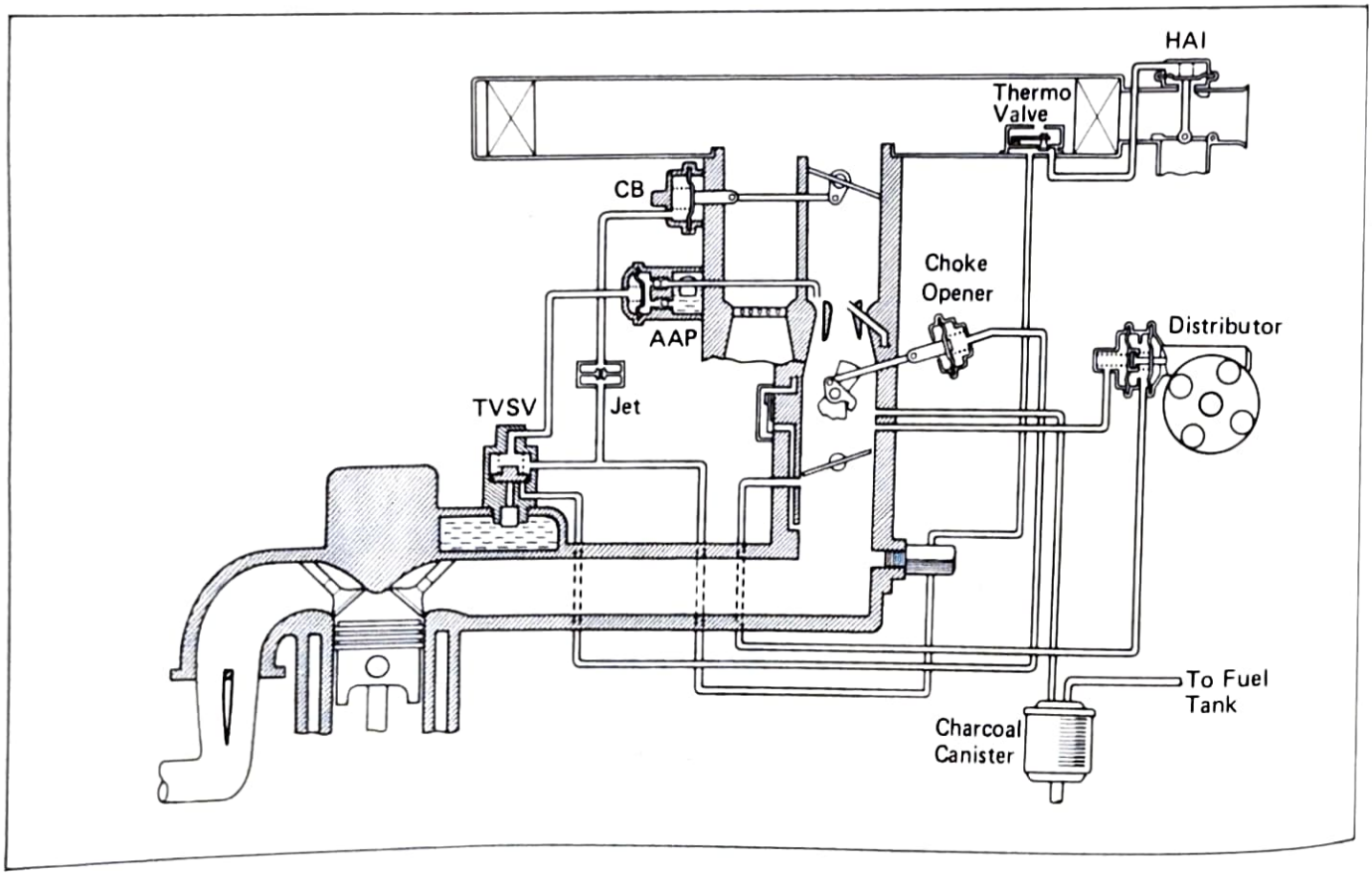
Component Layout and Schematic Drawing (RN C&C)



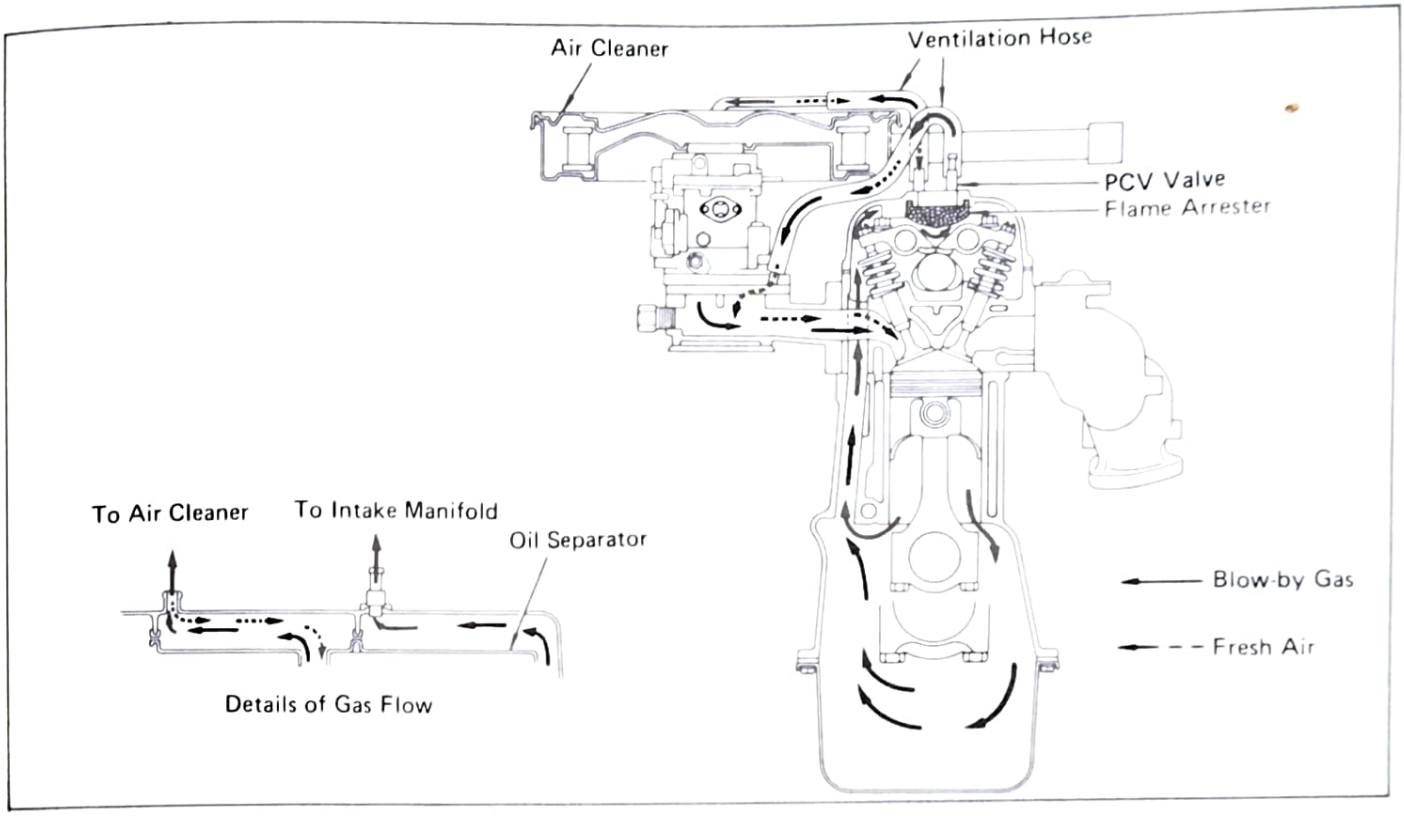


Component Layout and Schematic Drawing (Canada RN 4×4)



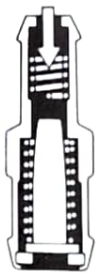


Positive Crankcase Ventilation (PCV) System



To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

Engine not Running or if Backfiring

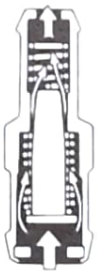


Intake Manifold Side

- PCV VALVE IS CLOSED.

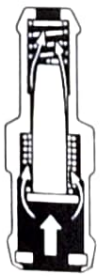
Cylinder Head Side

Normal Operation



- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS LARGE.

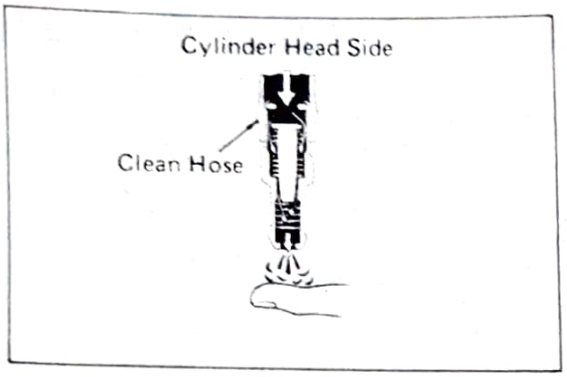
Idling or Decelerating



- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS SMALL.

Acceleration or High Load

- PCV VALVE IS FULLY OPEN.

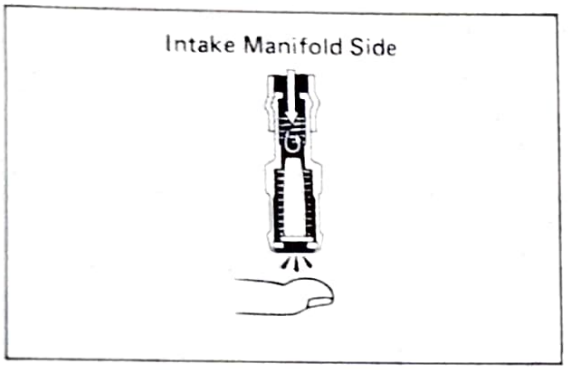


INSPECTION OF PCV VALVE

1. REMOVE PCV VALVE
2. ATTACH A CLEAN HOSE TO PCV VALVE
3. BLOW FROM CYLINDER HEAD SIDE

   Check that air passes through easily.

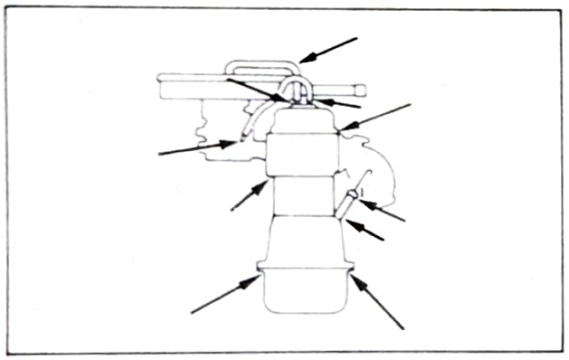
   CAUTION: **Do not suck air through the valve. Petroleum substances inside the valve are harmful.**



4. BLOW FROM INTAKE MANIFOLD SIDE

   Check that air passes through with difficulty.
   If the PCV valve fails either of the checks, replace it.

5. REINSTALL PCV VALVE



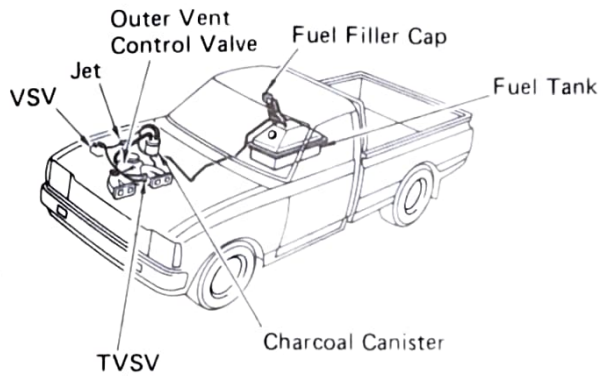
INSPECTION OF PCV HOSES AND CONNECTIONS

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

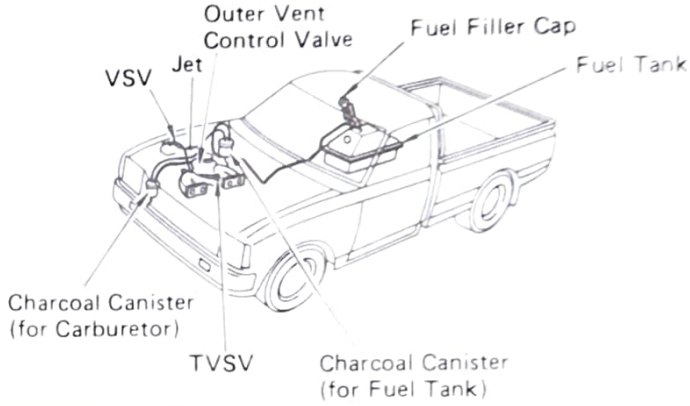
Check for cracks, leaks or damage.

Fuel Evaporative Emission Control (EVAP) System (Without HAC System (Except Canada 4×4) and Calif.4×4)

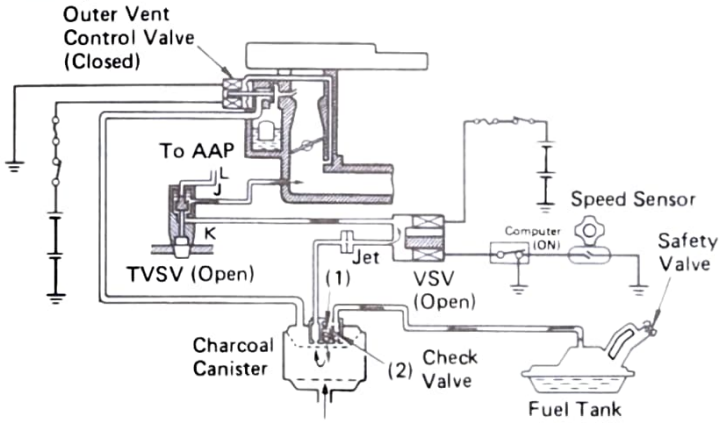
RN 4x2 (Ex. RN C&C)



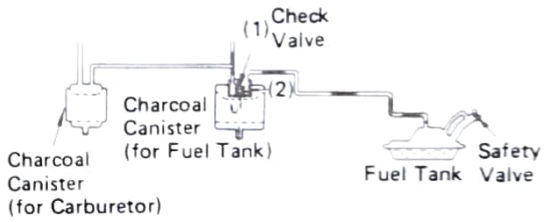
RN 4x4 (Ex. Canada 4x4)



RN 4x2 (Ex. RN C&C)



RN 4x4 (Ex. Canada 4x4)



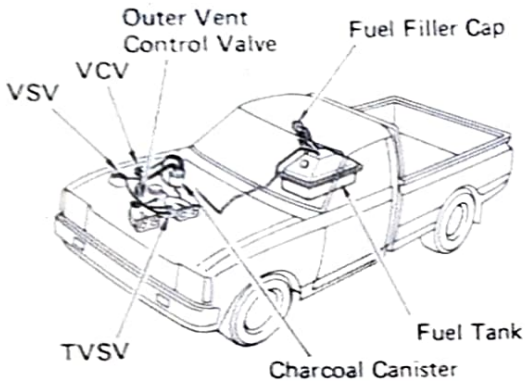
To reduce HC emissions, evaporated fuel from fuel tank and float chamber is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

IG S/W	Engine	*Outer Vent Control Valve	Coolant Temp.	TVSV	Vehicle Speed	Computer	VSV	Check Valve (1)	Check Valve (2)	Safety Valve in Cap	Evaporated Fuel (HC)
OFF	Not running	OPEN	—	—	—	—	—	—	—	—	HC from tank and float chamber is absorbed into the canister.
ON	Running	CLOSED	Below 60° C (140° F)	CLOSED (J–K)	—	—	—	—	—	—	HC from tank is absorbed into the canister.
			Above 75° C (167° F)	OPEN (J–K)	Below 7 mph (11 km/h)	OFF	CLOSED	—	—	—	
					Above 16 mph (26 km/h)	ON	OPEN	—	—	—	HC from canister is led into the intake manifold.
High pressure in tank		—	—	—	—	—	—	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank		—	—	—	—	—	—	CLOSED	OPEN	OPEN	(Air is led into the tank.)

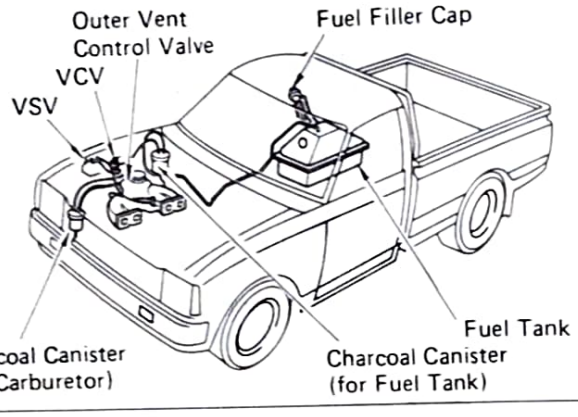
Remarks: *The outer vent control valve is pulled by intake manifold vacuum and held by the solenoid. The solenoid itself cannot pull the valve.

Fuel Evaporative Emission Control (EVAP) System (With HAC System Vehicle (Except Calif.4×4))

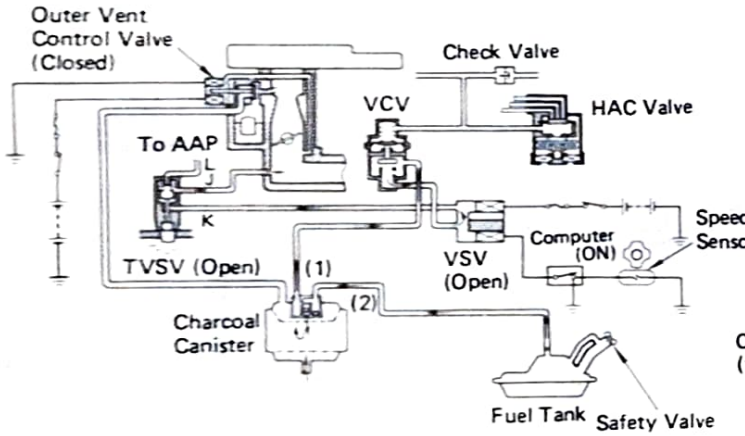
RN 4x2 (Ex. RN C&C)



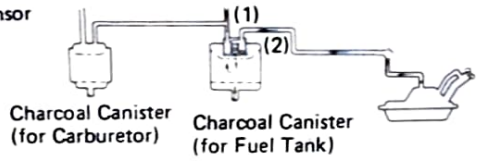
RN 4x4 and RN C&C



RN 4x2 (Ex. RN C&C)



RN 4x4 and RN C&C

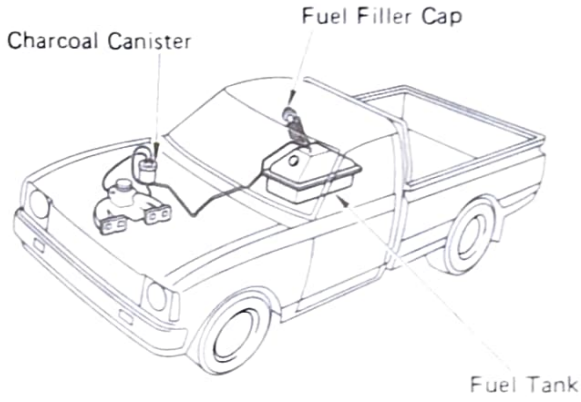


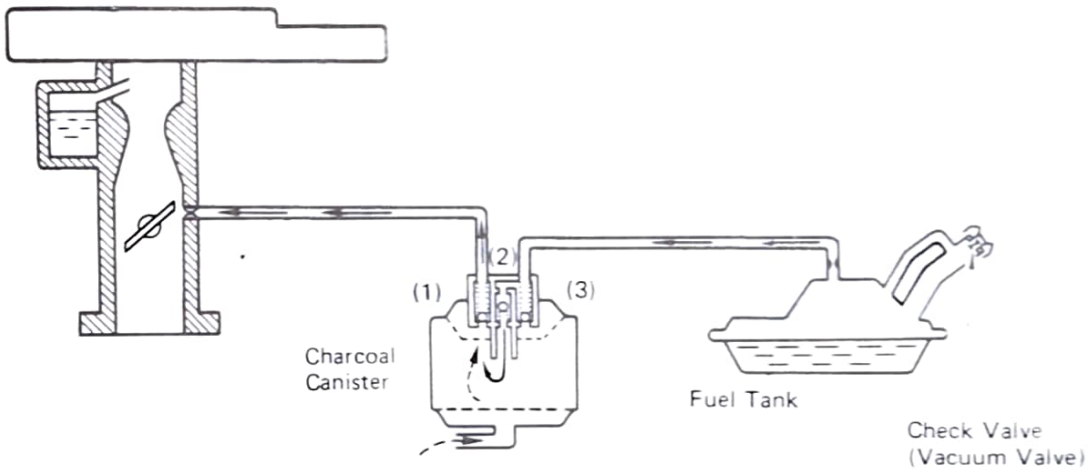
To insure reduction of HIC emission at high altitude, evaporated fuel from fuel tank and float chamber is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

IG S/W	Engine	*Outer Vent Control Valve	Coolant Temp.	TVSV	Vehicle Speed	Computer	VSV	**Altitude	VCV	Check Valve (1)	Check Valve (2)	Safety Valve in Cap	Evaporated Fuel (HC)
OFF	Not running	OPEN	—	—	—	—	—	—	—	—	—	—	HC from tank and float chamber is absorbed into the canister.
ON	Running	CLOSED	Below 60°C (140°F)	CLOSED (J–K)	—	—	—	—	—	—	—	—	HC from tank is absorbed into the canister
			Above 75°C (167°F)	OPEN (J–K)	Below 7 mph (11 km/h)	OFF	CLOSED	—	—	—	—	—	
					Above 16 mph (26 km/h)	ON	OPEN	Low Below 783m (2,570 ft)	CLOSED	—	—	—	HC from canister is led into the intake manifold
								High Above 1,198m (3,930 ft)	OPEN	—	—	—	HC from canister is compensated to intake manifold.
High pressure in tank		—	—	—	—	—	—	—	—	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister
High vacuum in tank		—	—	—	—	—	—	—	—	CLOSED	OPEN	OPEN	(Air is led into the tank.)

Remarks: * The outer vent control valve is pulled by intake manifold vacuum and held by the solenoid. The solenoid itself cannot pull the valve.
** Refer to the page 3-86 of the HAC system.

Fuel Evaporative Emission Control (EVAP) System (Canada 4×4)

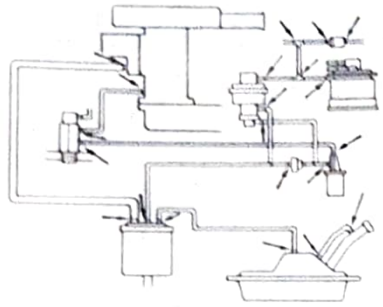




To reduce HC emission, evaporated fuel from fuel tank is routed through the charcoal canister to the carburetor for combustion in the cylinders.

Condition	Check Valve (1)	Check Valve (2)	Check Valve (3)	Safety Valve in Cap	Evaporated Fuel (HC)
Parking, idling & low speed	CLOSED	—	—	—	HC from tank is absorbed in the canister.
Medium & high speed	OPEN	—	—	—	HC from canister is led into carburetor.
High pressure in tank	—	OPEN	CLOSED	CLOSED	HC from tank is absorbed in the canister.
High vacuum in tank	—	CLOSED	OPEN	OPEN	(Air is led into the tank.)

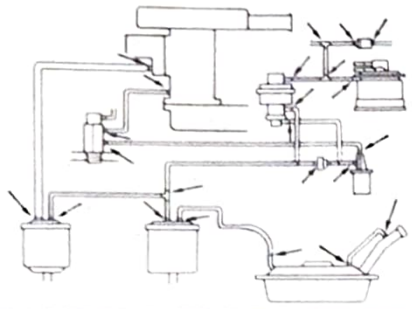
RN 4x2 (Ex. RN C&C)



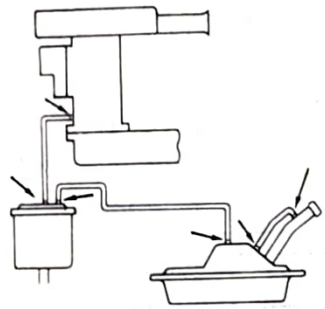
INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

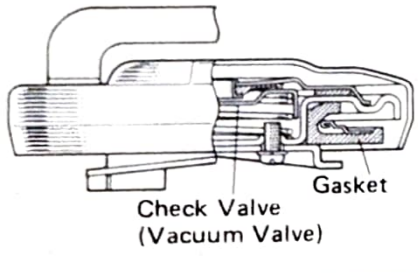
1. VISUALLY INSPECT LINES AND CONNECTIONS
   Look for loose connections, sharp bends or damage.
2. VISUALLY INSPECT FUEL TANK
   Look for deformation, cracks or fuel leakage.

RN 4x4, RN C&C (Ex. Canada 4x4)



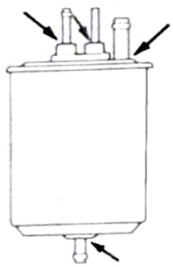
Canada RN 4x4





3. VISUALLY INSPECT FUEL TANK CAP
   (a) Remove four screws and retainer.
   (b) Look for damaged or deformed gasket.
   (c) Reinstall the retainer.
   If a problem is found, repair or replace the cap.

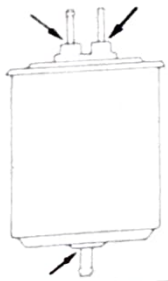
RN 4x2 (Ex. RN C&C)



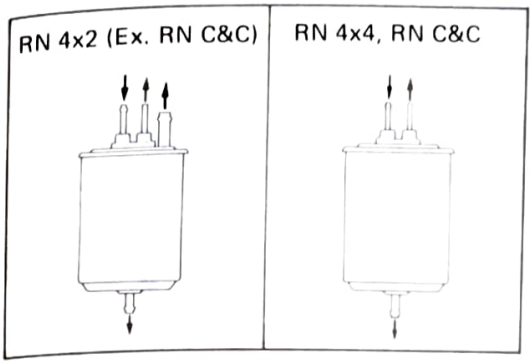
INSPECTION OF CHARCOAL CANISTER(S)

1. REMOVE CHARCOAL CANISTER(S)
2. VISUALLY INSPECT CHARCOAL CANISTER CASE(S)
   Look for cracks or damage.

RN 4x4, RN C&C



RN 4x4 (Ex. Canada RN 4x4), RN C&C

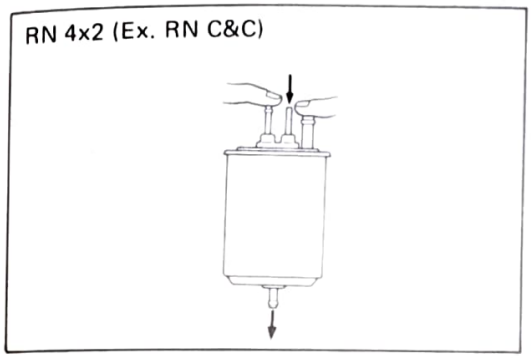


3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air, blow into the tank pipe and check that the air flows without resistance from the other pipes.

(b) Blow into the purge pipe and check that the air flows without resistance from the other pipes.

If a problem is found, replace the charcoal canister.



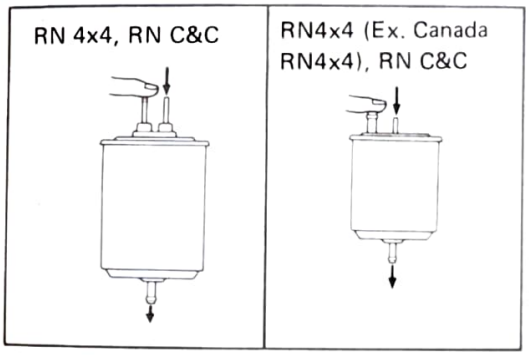
4. CLEAN FILTER IN CANISTER(S)

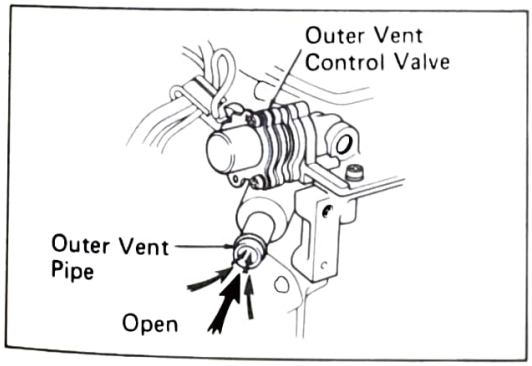
Clean the filter by blowing 3 kg/cm^2 (43 psi) air into the purge pipe, while holding the other upper canister pipes closed.

NOTE:

- Do not attempt to wash the canister.
- No activated carbon should come out.

5. REINSTALL CHARCOAL CANISTER(S)



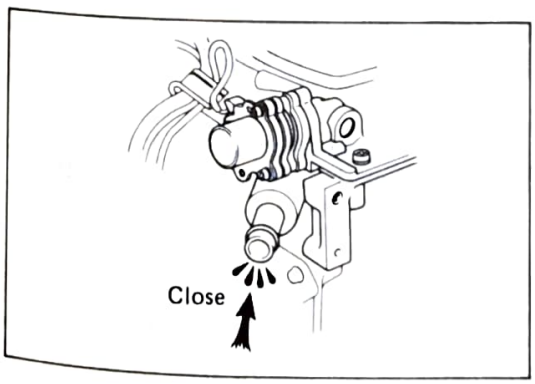


INSPECTION OF OUTER VENT CONTROL VALVE

1. CHECK OUTER VENT CONTROL VALVE OPERATION

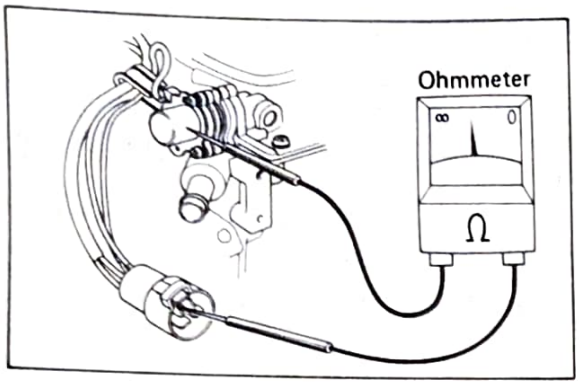
(a) Disconnect the outer vent hose from the carburetor.

(b) Blow air into the outer vent pipe and check that the outer vent control valve is open.



(c) Start the engine.

(d) With the engine idling, blow air into the outer vent pipe and check that the outer vent control valve is closed.

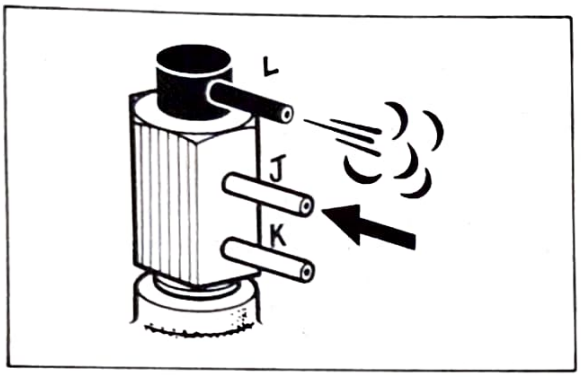


2. CHECK SOLENOID

(a) Unplug the wiring connector.

(b) Using an ohmmeter, measure the resistance between the positive (+) terminal and the solenoid body.

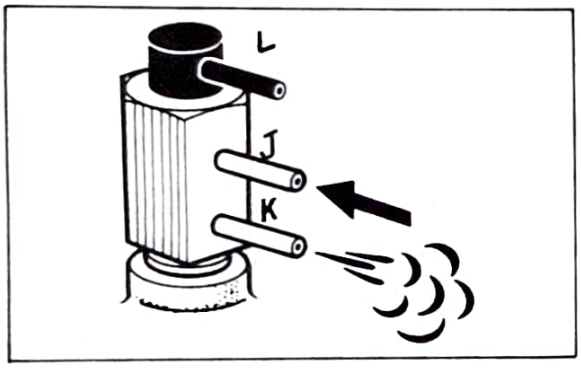
Specified resistance: 63 – 73 ohms at 20° C (68° F)



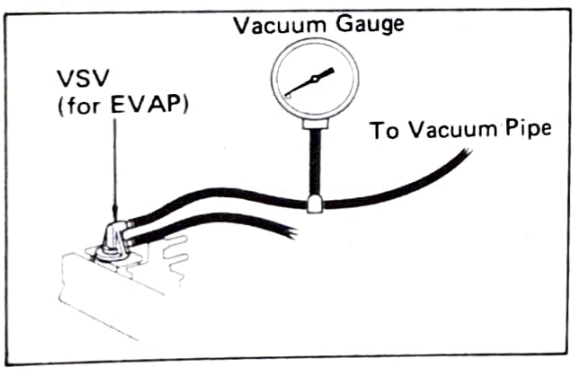
INSPECTION OF TVSV

CHECK TVSV BY BLOWING AIR INTO PIPE

(a) With coolant temperature below 60°C (140°F), blow air into pipe J and check that air comes out of pipe L.



(b) After warming up the engine, blow air into pipe J and check that air comes out of pipe K.

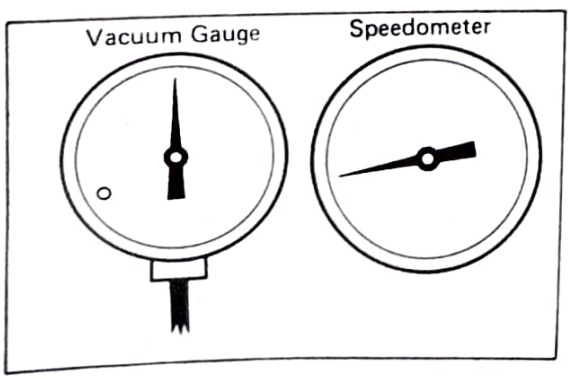


INSPECTION OF SPEED SENSOR TO VSV

1. CONNECT VACUUM GAUGE

(a) Using a 3-way connector, connect the vacuum gauge to the hose between the VSV and vacuum pipe.

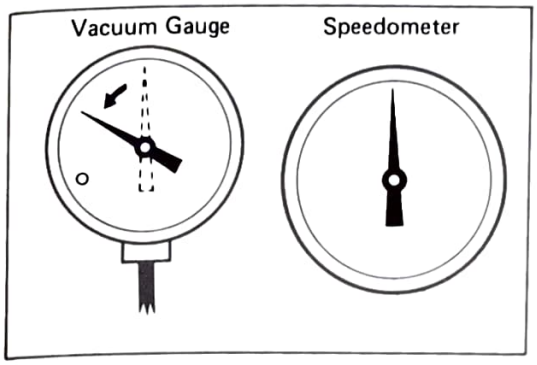
(b) Set the gauge at the driver's seat.



2. PERFORM ROAD TEST, OBSERVING SPEEDOMETER AND VACUUM GAUGE

(a) Warm up the engine.

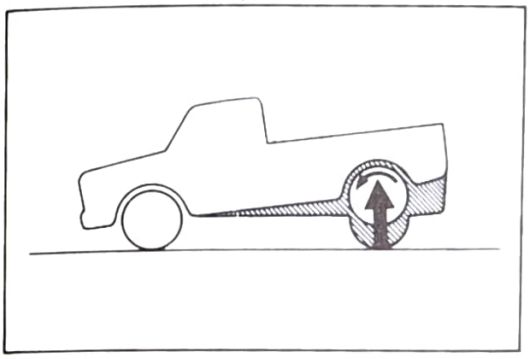
(b) Check that the vacuum gauge indicates intake manifold vacuum at low speed driving (below 7 mph or 11 km/h).



(c) Check that the vacuum gauge indicates lower than the intake manifold vacuum at middle and high speed driving (above 16 mph or 26 km/h).

If a problem is found, inspect speed sensor and VSV.

3. REMOVE VACUUM GAUGE AND RECONNECT HOSE



INSPECTION OF SPEED SENSOR

1. JACK UP ONE REAR WHEEL TO CLEAR GROUND
2. RELEASE PARKING BRAKE
3. SET SHIFT LEVER INTO NEUTRAL
4. UNPLUG WIRING CONNECTOR FROM COMPUTER

   Computer location: Left Cowl Side

5. CHECK ON-OFF CYCLES OF SPEED SENSOR

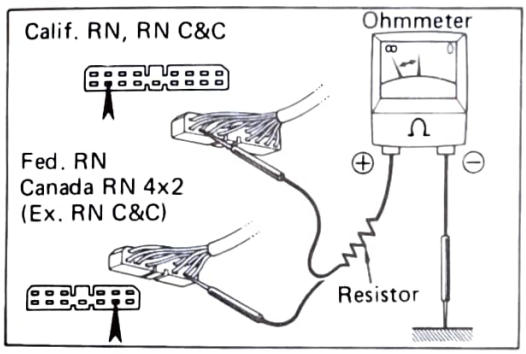
   (a) Place (+) terminal of the ohmmeter on the wiring connector terminal and (–) terminal on ground.

   (b) Turn the rear wheel slowly.

   (c) Check that the ohmmeter needle deflects consistently.

   CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.

   If the ohmmeter needle does not deflect, check that the speed sensor terminals at the back side of the speedometer are properly connected. If the connection is OK, replace the speedometer assembly.



6. RECONNECT WIRING CONNECTOR TO COMPUTER

INSPECTION OF VSV

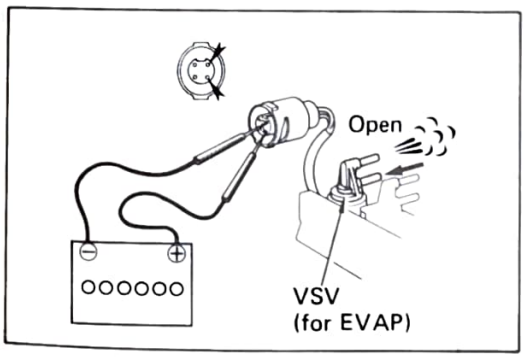
1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

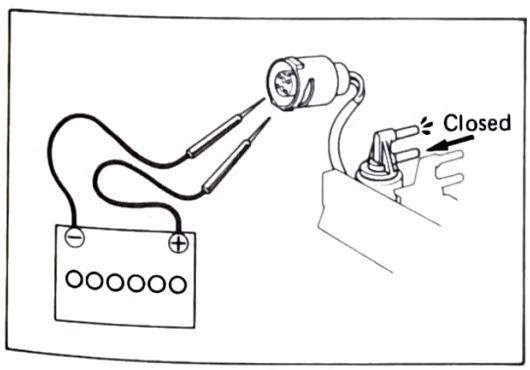
   (a) Connect the VSV terminals to the battery terminal as shown.

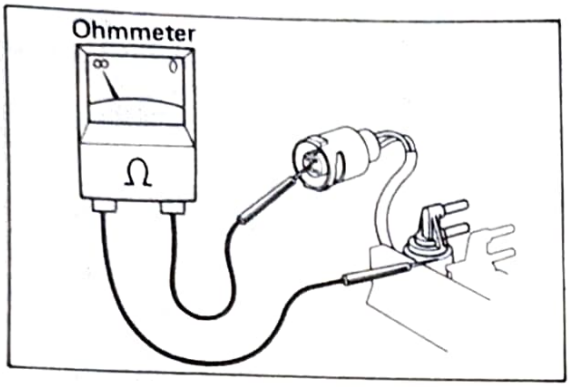
   (b) Blow into a pipe, and check that the VSV is open.

   (c) Disconnect the battery positive (+) terminal.

   (d) Blow into a pipe and check that the VSV is closed.



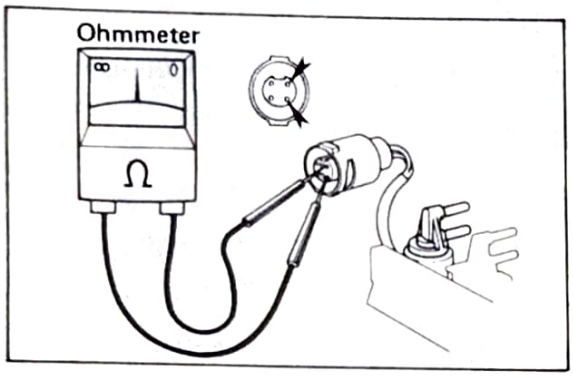




2. **CHECK FOR SHORT CIRCUIT**

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV body.

If a short circuit is found, repair or replace the VSV.



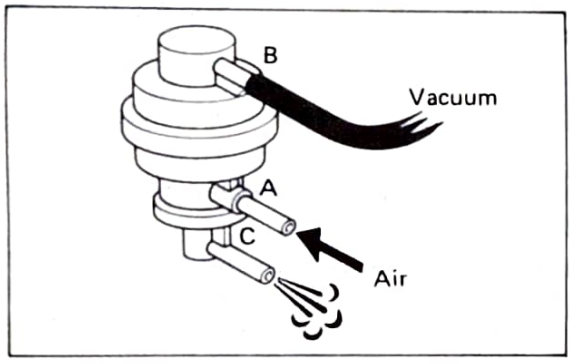
3. **CHECK FOR OPEN CIRCUIT**

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.

Specified resistance:

51 – 57 ohms at 20°C (68°F)

If the resistance is not within specification, replace the VSV.

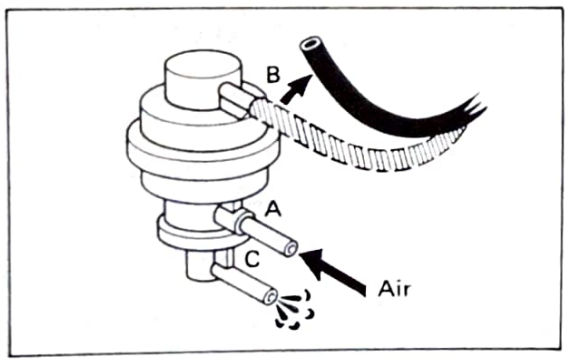


INSPECTION OF VCV

CHECK VCV BY BLOWING AIR INTO PIPE

(a) Apply vacuum above 250 mm Hg (9.84 in. Hg) to pipe B.

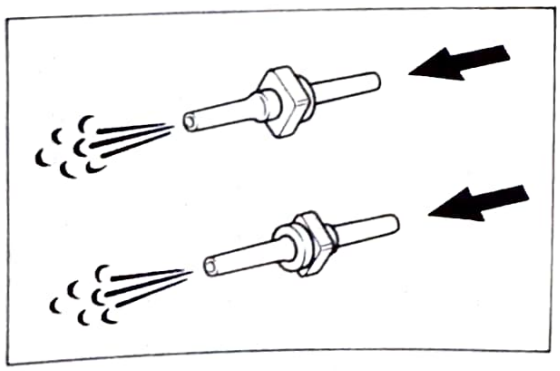
(b) Check that a large amount of air flows from A to C.



(c) Release the applied vacuum.

(d) Check that a small amount of air flows from A to C.

If a problem is found, replace the VCV.

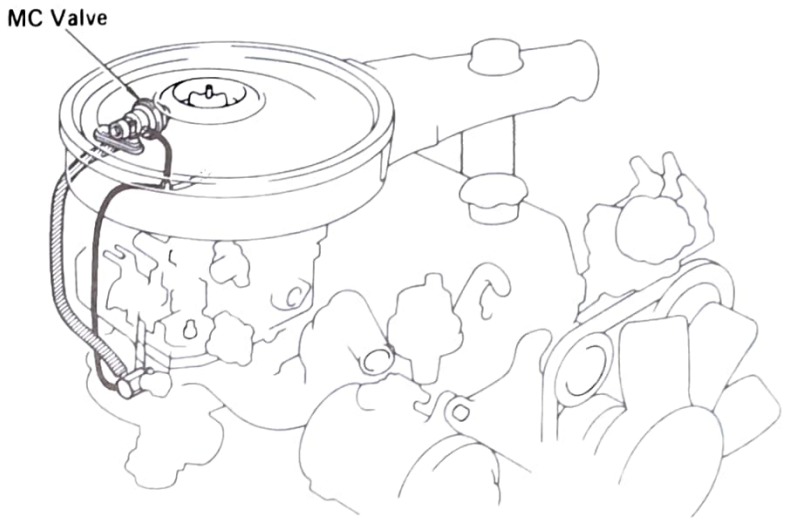


INSPECTION OF JET

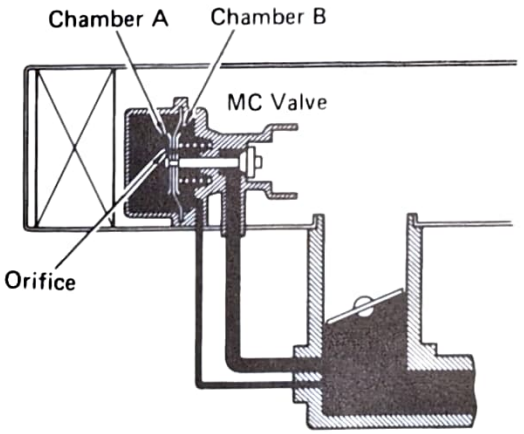
CHECK JET BY BLOWING AIR FROM EACH SIDE

Check for stoppage.

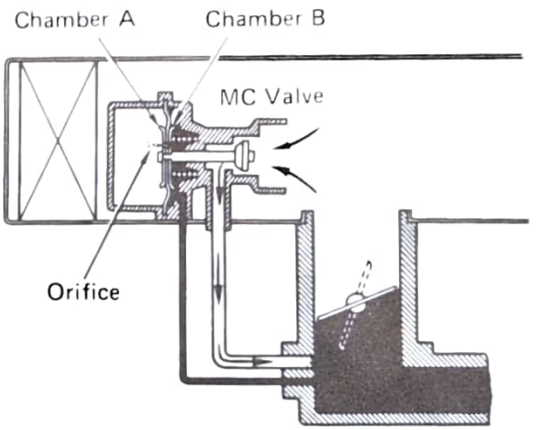
Mixture Control (MC) System (Calif. RN with M/T and RN C&C)



CONSTANT RPM

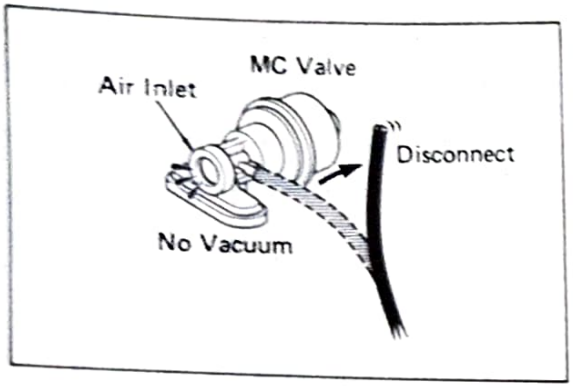


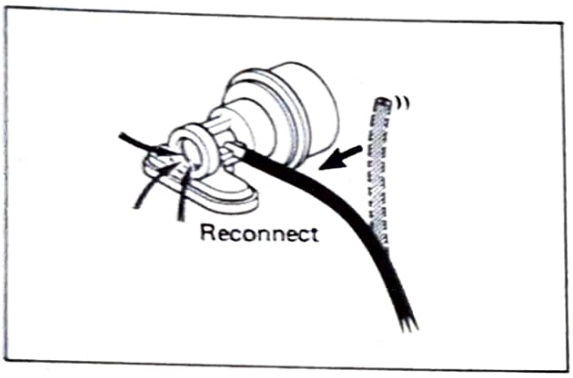
SUDDEN DECELERATION, STEP (1)



To reduce HC and CO emissions, this system allows air to enter the intake manifold on sudden deceleration.

Condition		Vacuum in Chamber A and B	MC Valve	Fresh Air
Constant RPM		Same vacuum	CLOSED	No air flow
Sudden deceleration	Step (1)	High vacuum acts on chamber B.	OPEN	Air is routed through MC valve to intake manifold.
	Step (2)	After a few seconds, vacuum in both chambers equalizes through the orifice.	CLOSED	No air flow



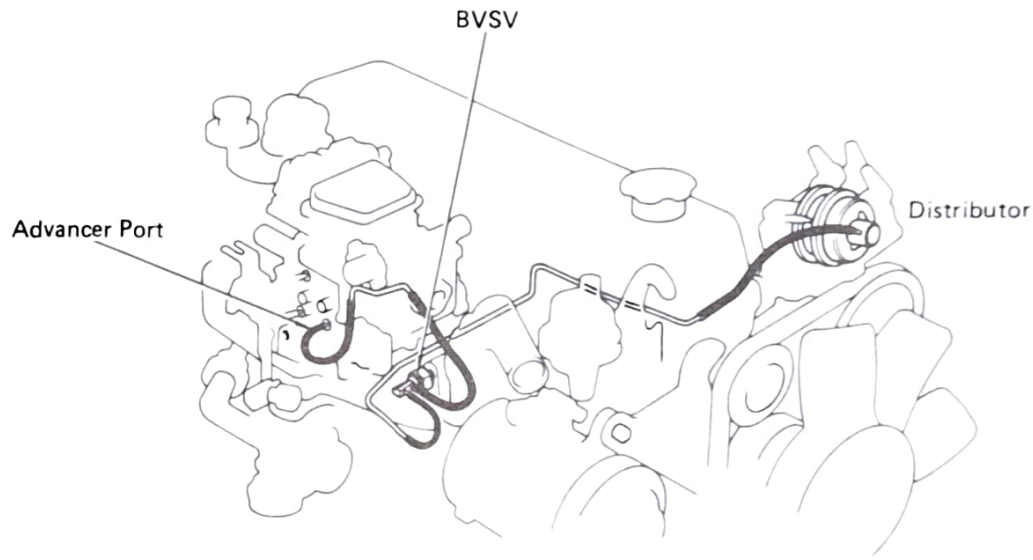


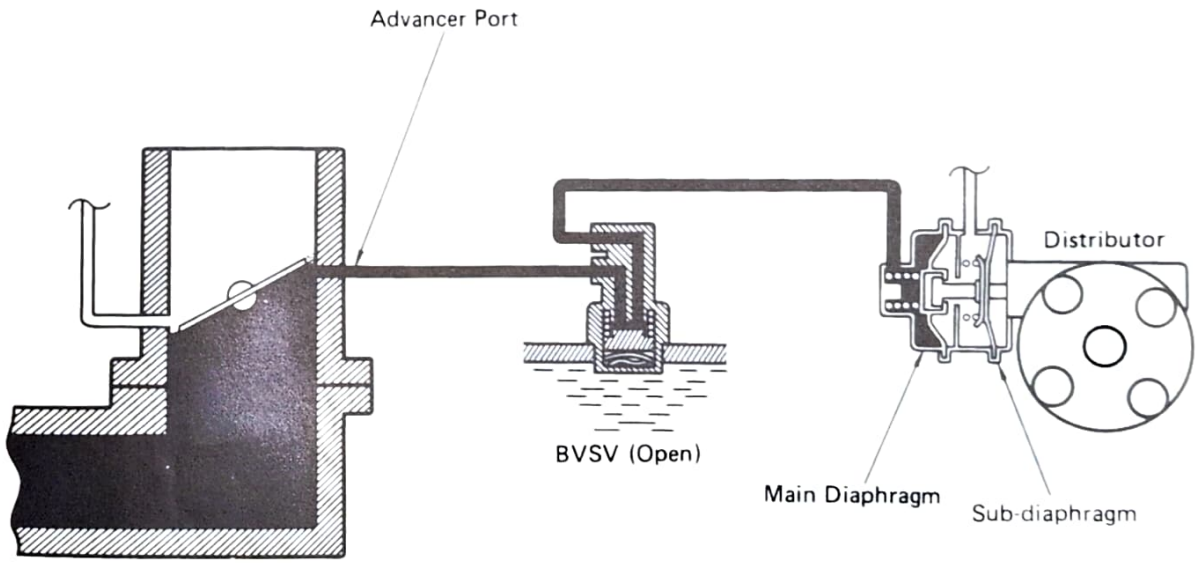
INSPECTION OF MC SYSTEM

1. REMOVE AIR CLEANER COVER AND AIR FILTER
2. START ENGINE
3. CHECK MC VALVE
   (a) Disconnect the vacuum hose from the MC valve.
   (b) Place your fingers over the air inlet of the MC valve.
   (c) Check that vacuum is not felt.
   (d) Reconnect the vacuum hose and check that vacuum is felt momentarily.

   NOTE: At this time, the engine will idle rough or die, but this is normal.
4. REINSTALL AIR FILTER AND CLEANER COVER

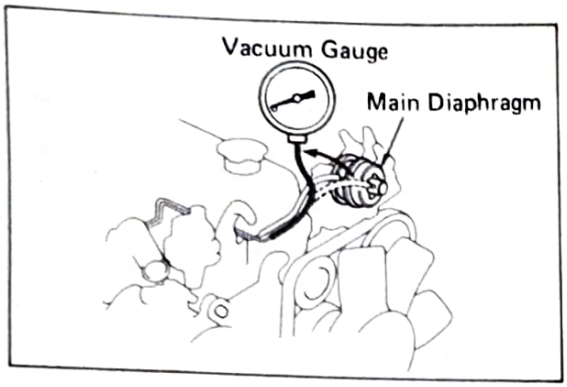
Spark Control (SC) System (Calif. RN and RN C&C)





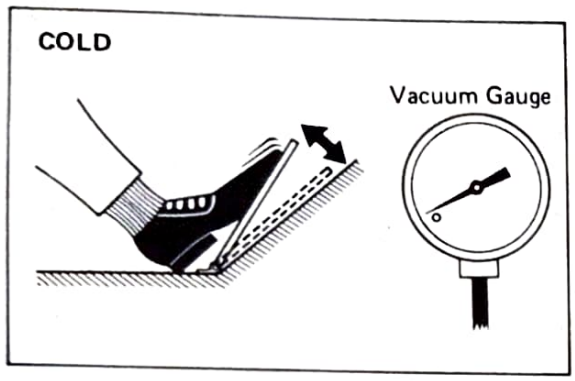
To hasten warming-up of the TWC, this system cuts the operation of distributor main vacuum advance only when the engine is cold.

Coolant Temp.	BVSV	Main Vacuum Advance
COLD Below 40°C (104°F)	CLOSED	NOT OPERATES
HOT Above 54°C (129°F)	OPEN	NORMALLY OPERATES

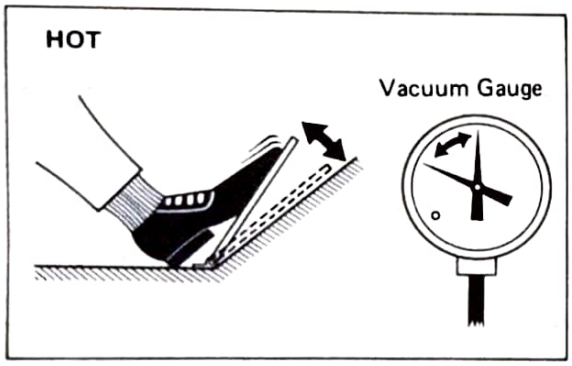


INSPECTION OF SC SYSTEM

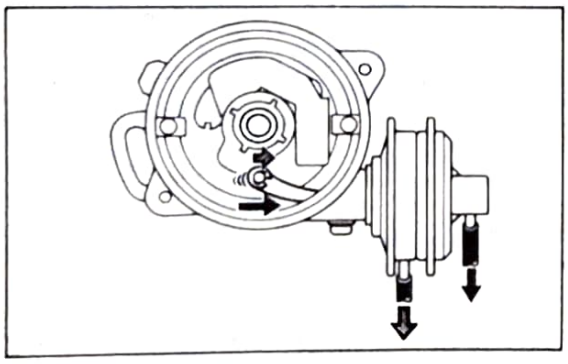
1. CONNECT VACUUM GAUGE TO DISTRIBUTOR MAIN DIAPHRAGM HOSE



2. CHECK BVSV WITH COLD ENGINE
   (a) The coolant temperature should be below 40°C (104°F).
   (b) Start the engine.
   (c) Check that the vacuum gauge indicates zero regardless of whether the throttle valve is open or closed.

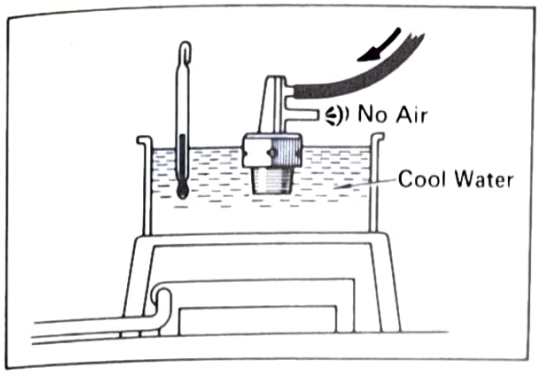


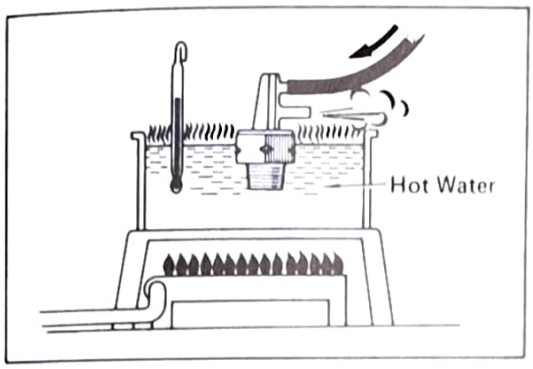
3. LET ENGINE WARM-UP TO NORMAL OPERATING TEMPERATURE
   Check that the vacuum changes quickly when the throttle valve is opened and closed.
4. DISCONNECT VACUUM GAUGE AND RECONNECT HOSE TO DISTRIBUTOR



5. CHECK OPERATION OF DISTRIBUTOR VACUUM ADVANCER
   (a) Remove the distributor cap and rotor.
   (b) Apply vacuum to the diaphragms, and check that the vacuum advancer moves in accordance with the vacuum.
   (c) Reinstall the rotor and distributor cap.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART





INSPECTION OF BVSV

CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 40°C (104°F) with cold water.

(d) Blow air into a pipe and check that the BVSV is closed.

(e) Heat the BVSV to above 54°C (129°F) with hot water.

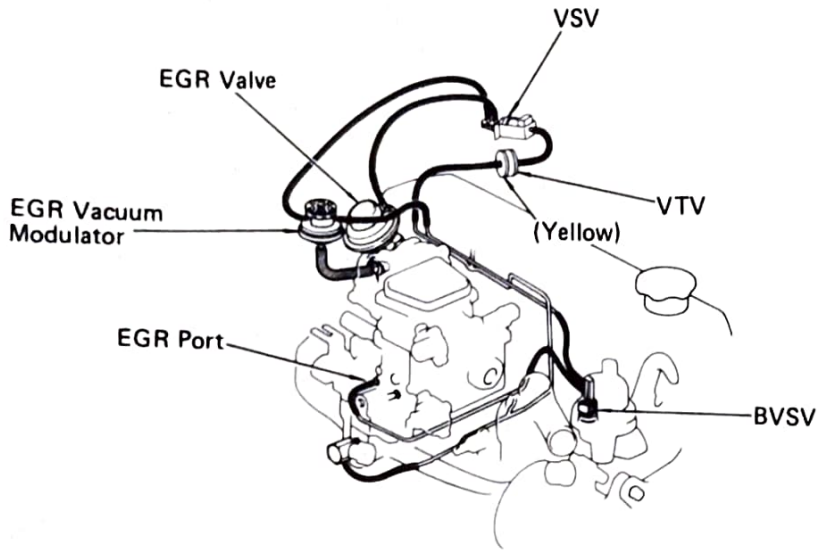
(f) Blow air into a pipe and check that the BVSV is open.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

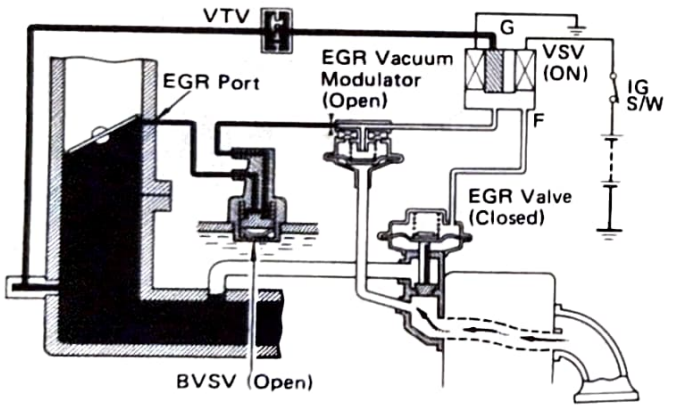
(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.

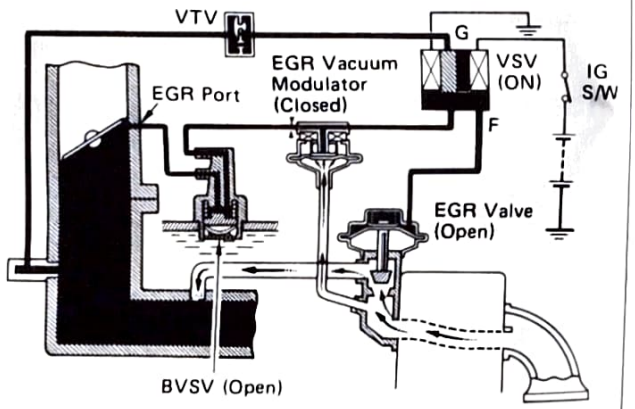
Exhaust Gas Recirculation (EGR) System (Calif. RN and RN C&C)



(1)



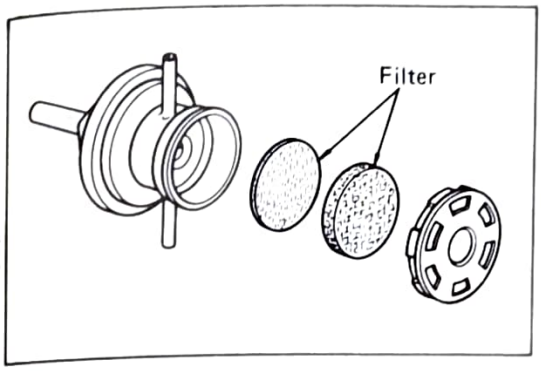
(2)



To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

IG S/W	*VSV	Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
ON	ON	Below 30°C (86°F)	CLOSED	—	—		—	CLOSED	Not recirculated
		Above 44°C (111°F)	OPEN	Positioned below EGR port	—		—	CLOSED	Not recirculated
				Positioned above EGR port	(1) LOW	**Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
					(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated

Remarks:
- * For prevention of dieseling, the VSV opens (Port F to G) when the ignition is turned off so the EGR valve opens by intake manifold vacuum, allowing the flow of EGR gas to the intake manifold and insuring smooth engine shutdown.
- ** Pressure increase → Modulator closes → EGR valve opens → Pressure drops
  ↑ EGR valve closes ← Modulator opens ←

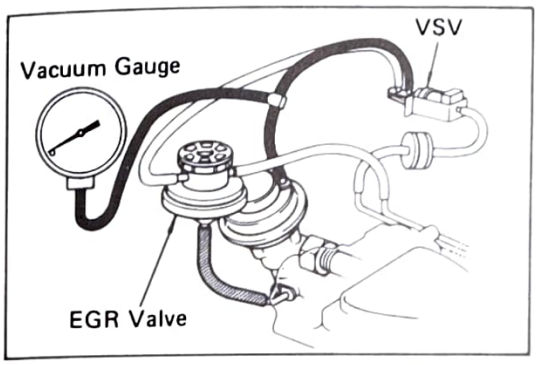


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination and damage.

(b) Using compressed air, clean the filter.

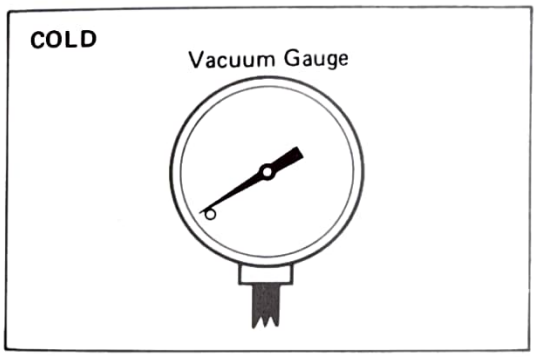


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and VSV.

3. CHECK SEATING OF EGR VALVE

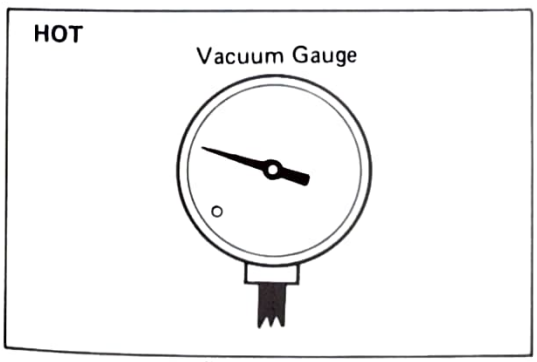
Start the engine and check that the engine starts and runs at idle.



4. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C (86°F).

(b) Check that the vacuum gauge indicates zero at 2,000 rpm.

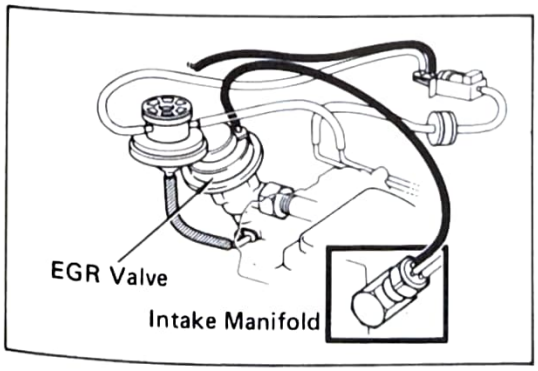


5. CHECK BVSV, VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 2,000 rpm.

(c) Disconnect the vacuum gauge and reconnect the vacuum hose to the proper location.



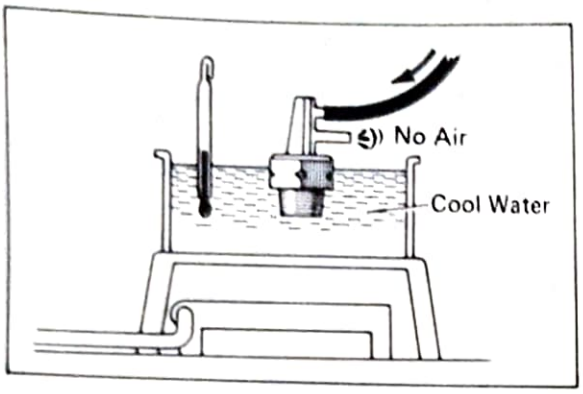
6. CHECK EGR VALVE

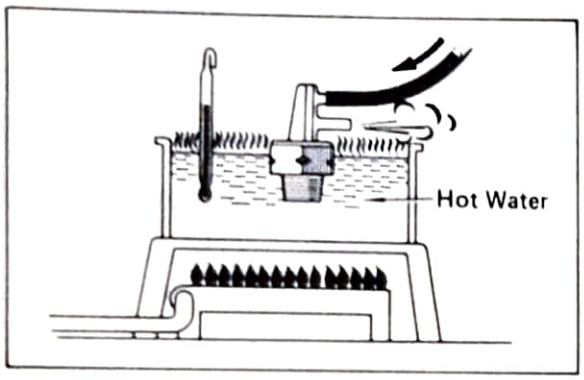
(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART





INSPECTION OF BVSV

CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 30°C (86°F) with cool water.

(d) Blow air into a pipe and check that the BVSV is closed.

(e) Heat the BVSV to above 44°C (111°F) with hot water.

(f) Blow air into a pipe and check that the BVSV is open.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Fill the radiator with coolant.

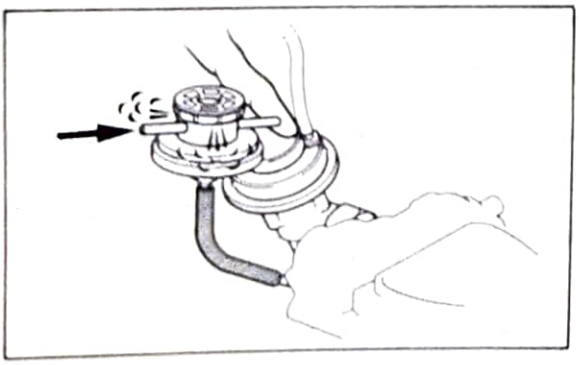
If a problem is found, replace the BVSV.

INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon deposits. If a problem is found, replace it.

2. INSTALL EGR VALVE WITH A NEW GASKET



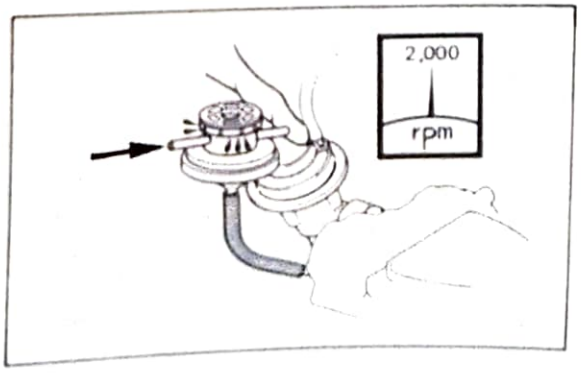
INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect two vacuum hoses from the EGR vacuum modulator.

(b) Plug the pipe with your finger.

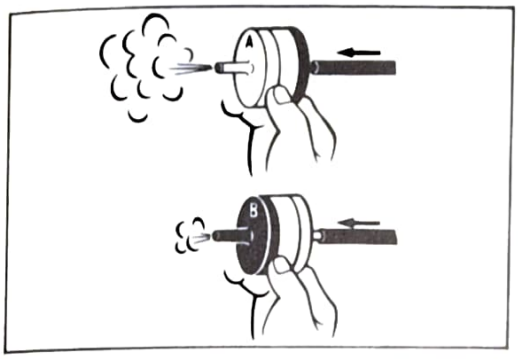
(c) Blow air into another pipe and check that the air passes through to the air filter side freely.



(d) Start the engine and maintain engine speed at 2,000 rpm.

(e) Repeat the above test and check that there is a strong resistance to air flow.

(f) Reconnect the vacuum hoses to the proper locations.



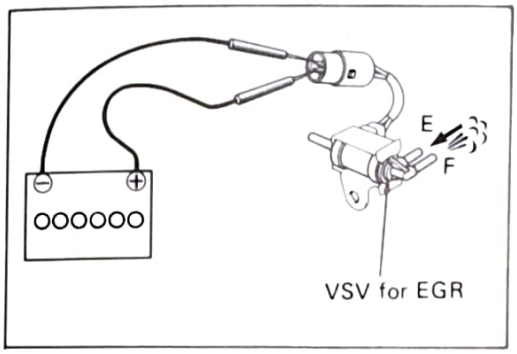
INSPECTION OF VTV

CHECK VTV BY BLOWING AIR INTO EACH SIDE

(a) Check that air flows without resistance from B to A.

(b) Check that air flows with difficulty from A to B.

If a problem is found, replace the VTV.

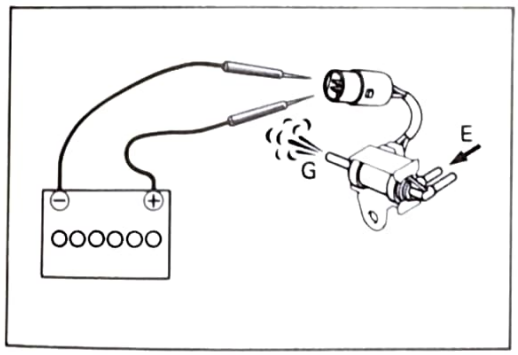


INSPECTION OF VSV

1. CHECK VACUUM CIRCUIT CONTINUITY IN THE VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

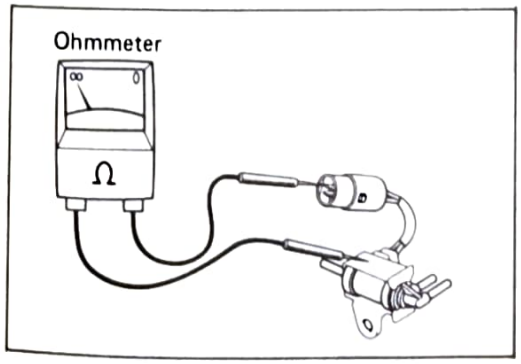
(b) Blow into pipe E and check that air comes out of pipe F.



(c) Disconnect the battery.

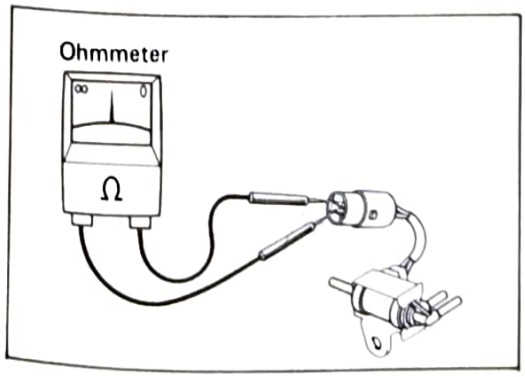
(d) Blow into pipe E and check that air comes out of pipe G.

If a problem is found, replace the VSV.



2. CHECK FOR SHORT-CIRCUIT

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV body. If there is continuity, replace the VSV.



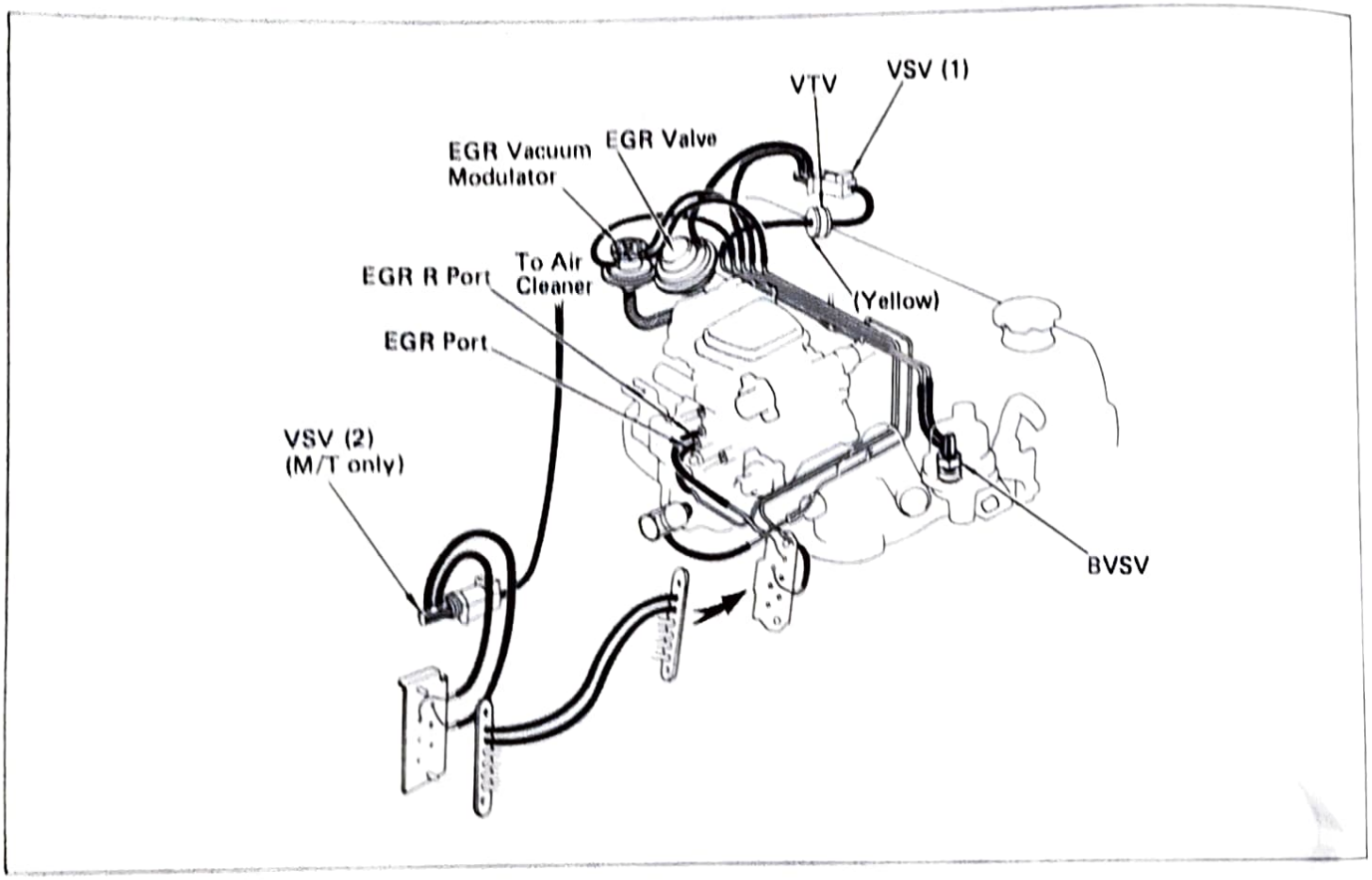
3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminal as shown.

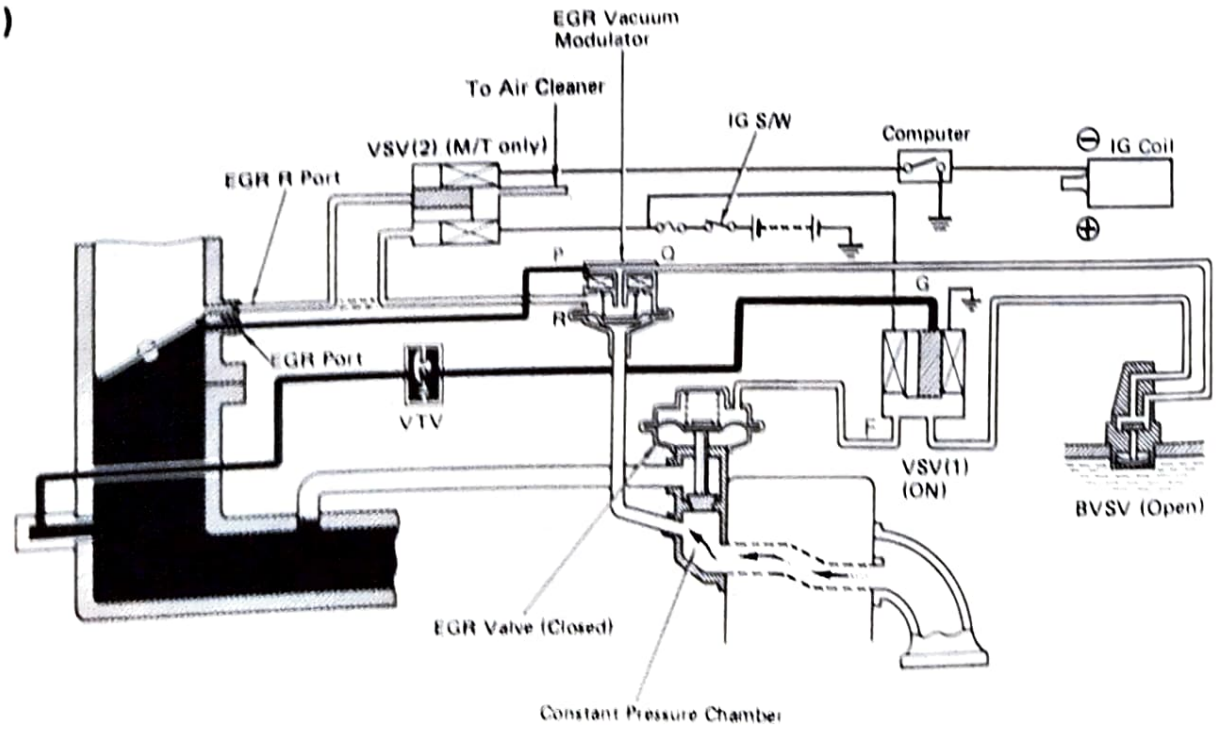
Specified resistance: 38 – 43 ohms at 20°C (68°F)

If the resistance is not within specification, replace the VSV.

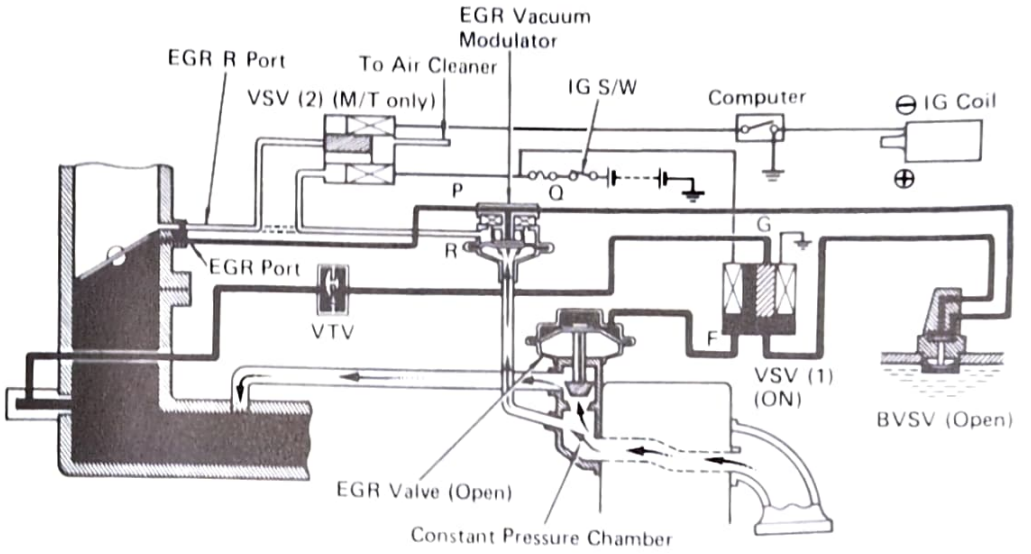
Exhaust Gas Recirculation (EGR) System (Fed. RN and Canada RN 4×2 (except RN C&C))



(1)



(2)



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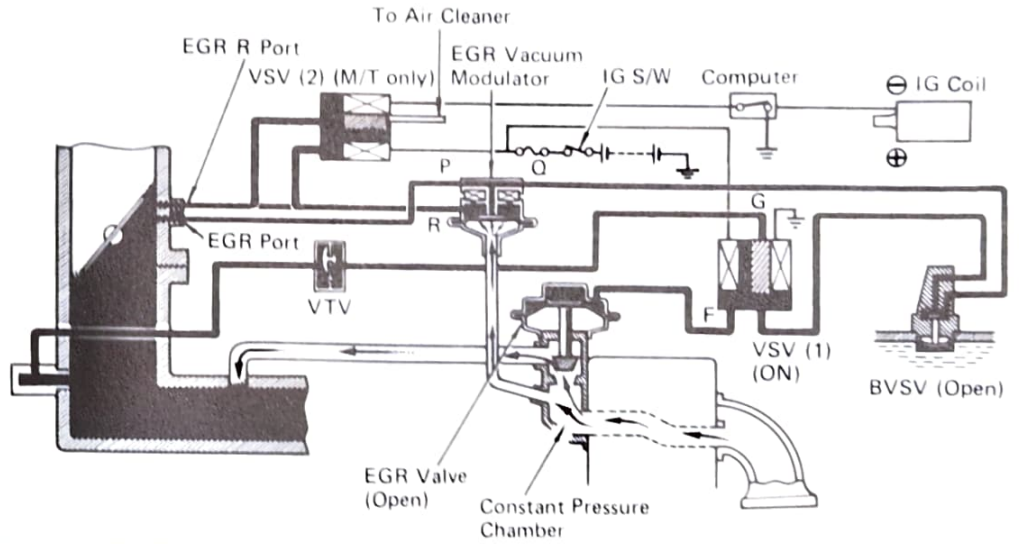
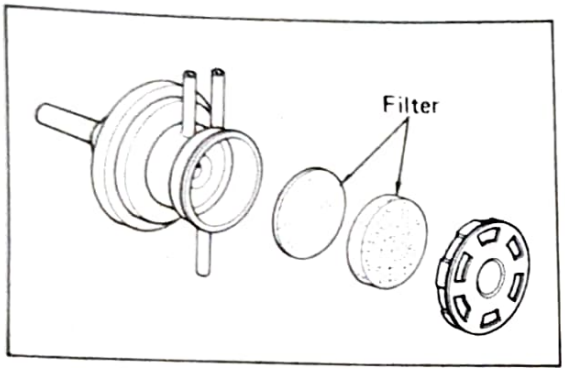


To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

IG S/W	* VSV	Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
ON	ON	Below 30°C (86°F)	CLOSED	—	—		—	CLOSED	Not recirculated
		Above 44°C (111°F)	OPEN	Positioned below EGR port	—		—	CLOSED	Not recirculated
				**Positioned above EGR port	(1) LOW	***Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
					(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated

Remarks:

- * For prevention of dieseling, the VSV opens (Port F to G) when the ignition is turned off so the EGR valve opens by intake manifold vacuum, allowing the flow of EGR gas to the intake manifold and insuring smooth engine shutdown.
- ** When the throttle valve is positioned above the EGR R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low. For vehicles with M/T, this is accomplished because the VSV is open above 1,700 rpm.
- *** Pressure increase → Modulator closes → EGR valve opens → Pressure drops
  ↑ EGR valve closes ← Modulator opens ←

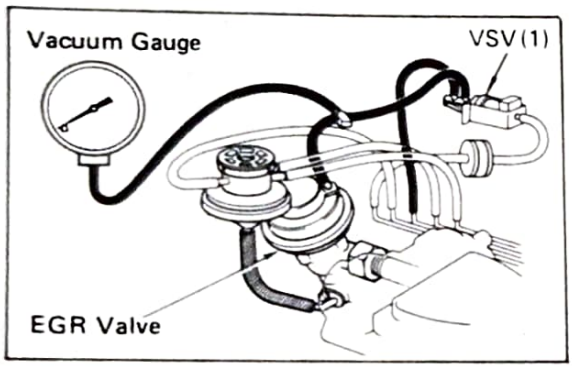


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

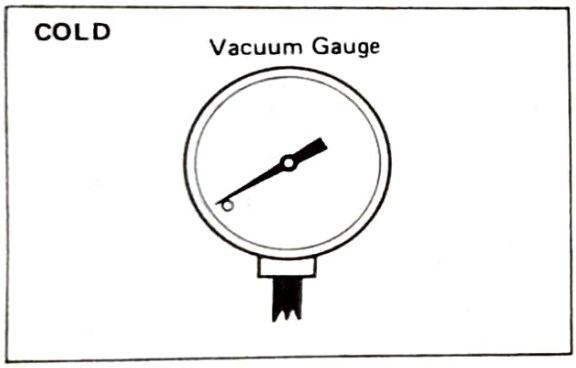


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and VSV.

3. CHECK SEATING OF EGR VALVE

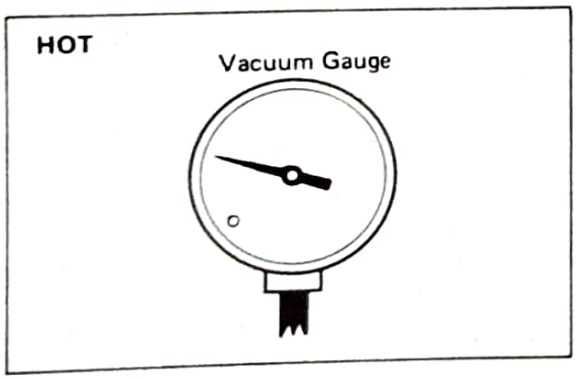
Start the engine and check that the engine starts and runs at idle.



4. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C (86°F).

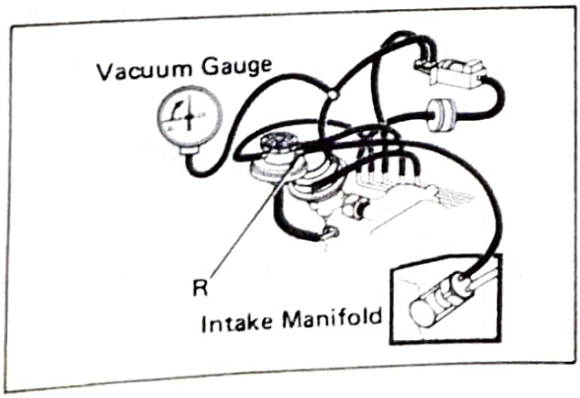
(b) Check that the vacuum gauge indicates zero at 2,000 rpm.



5. CHECK BVSV, VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates high vacuum at 2,000 rpm.

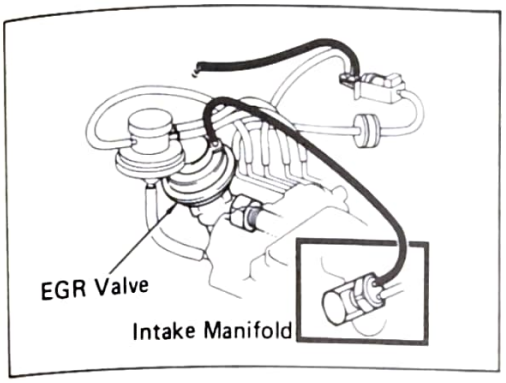


(c) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 2,000 rpm.

NOTE: As a large amount of EGR gas enters, the engine will misfire slightly at this time.

(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.

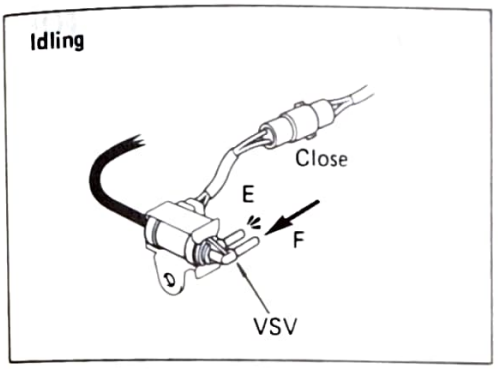


6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine dies.

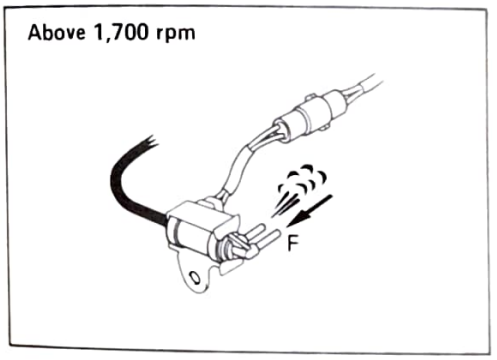
(c) Reconnect the vacuum hoses to the proper location.



7. CHECK COMPUTER TO VSV (M/T Vehicle Only)

(a) Disconnect the vacuum hoses from pipe E and pipe F of the VSV.

(b) With the engine idling, blow air into pipe F and check that the VSV is closed.

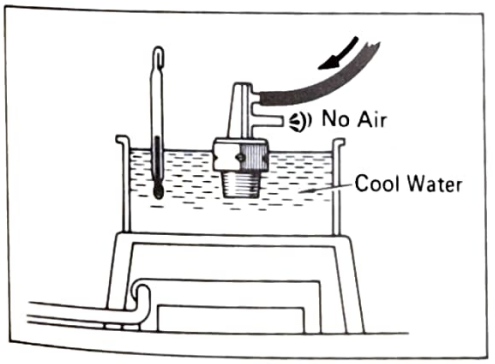


(c) Increase the engine speed to above 1,700 rpm.

(d) Blow air into pipe F and check that the VSV is open.

(e) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF BVSV

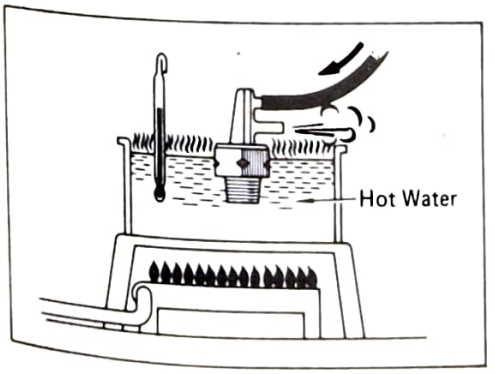
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 30°C (86°F) with cool water.

(d) Blow air into a pipe and check that the BVSV is closed.



(e) Heat the BVSV to above 44°C (111°F) with hot water.

(f) Blow air into a pipe and check that the BVSV is open.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Fill the radiator with coolant.

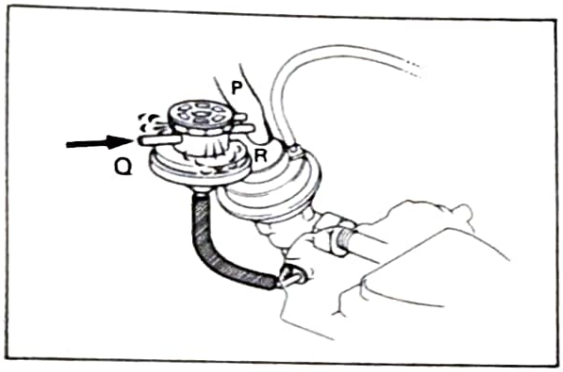
If a problem is found, replace the BVSV.

INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

   Check the valve for sticking and heavy carbon deposits. If a problem is found, replace it.

2. INSTALL EGR VALVE WITH A NEW GASKET



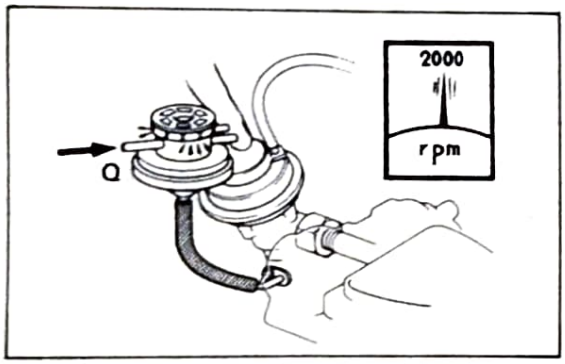
INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from port P, Q and R of the EGR vacuum modulator.

(b) Plug port P and R with your finger.

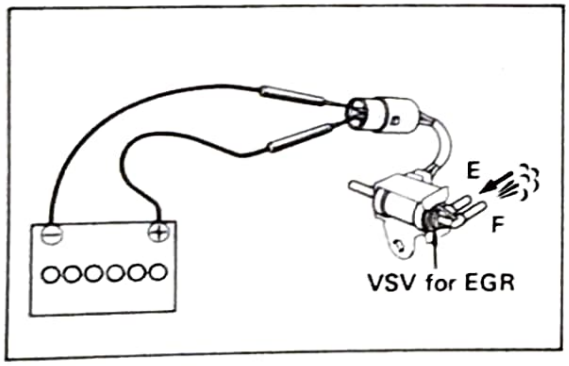
(c) Blow air into port Q. Check that the air passes through to the air filter side freely.



(d) Start the engine and maintain the engine speed at 2,000 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

(f) Reconnect the vacuum hoses to the proper locations.

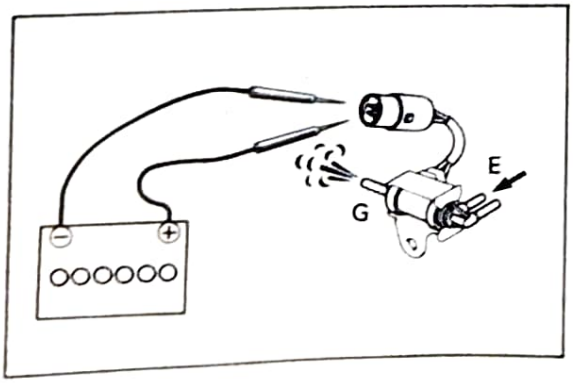


INSPECTION OF VSV(S)

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV(s) BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals, as shown.

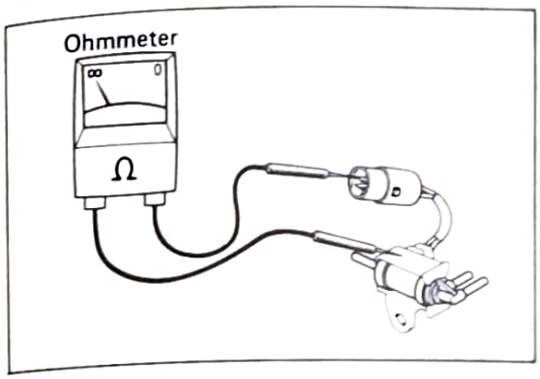
(b) Blow air into pipe E and check that air comes out of pipe F.



(c) Disconnect the battery connections.

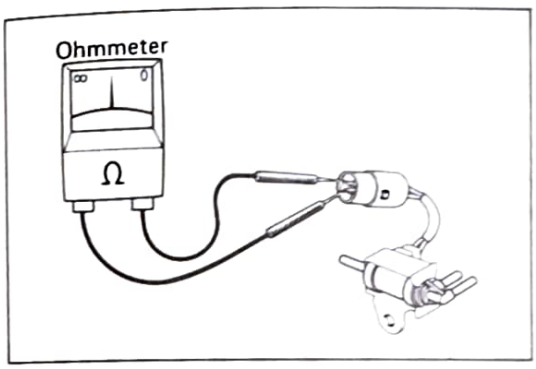
(d) Blow air into pipe E and check that air comes out of pipe G.

If a problem is found, replace the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV body.
If there is continuity, replace the VSV.

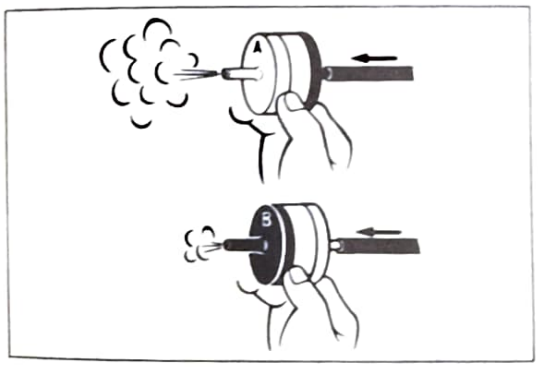


3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminal as shown.

Specified resistance: 38 – 43 ohms at 20°C (68°F)

If the resistance is not within specification, replace the VSV.



INSPECTION OF VTV

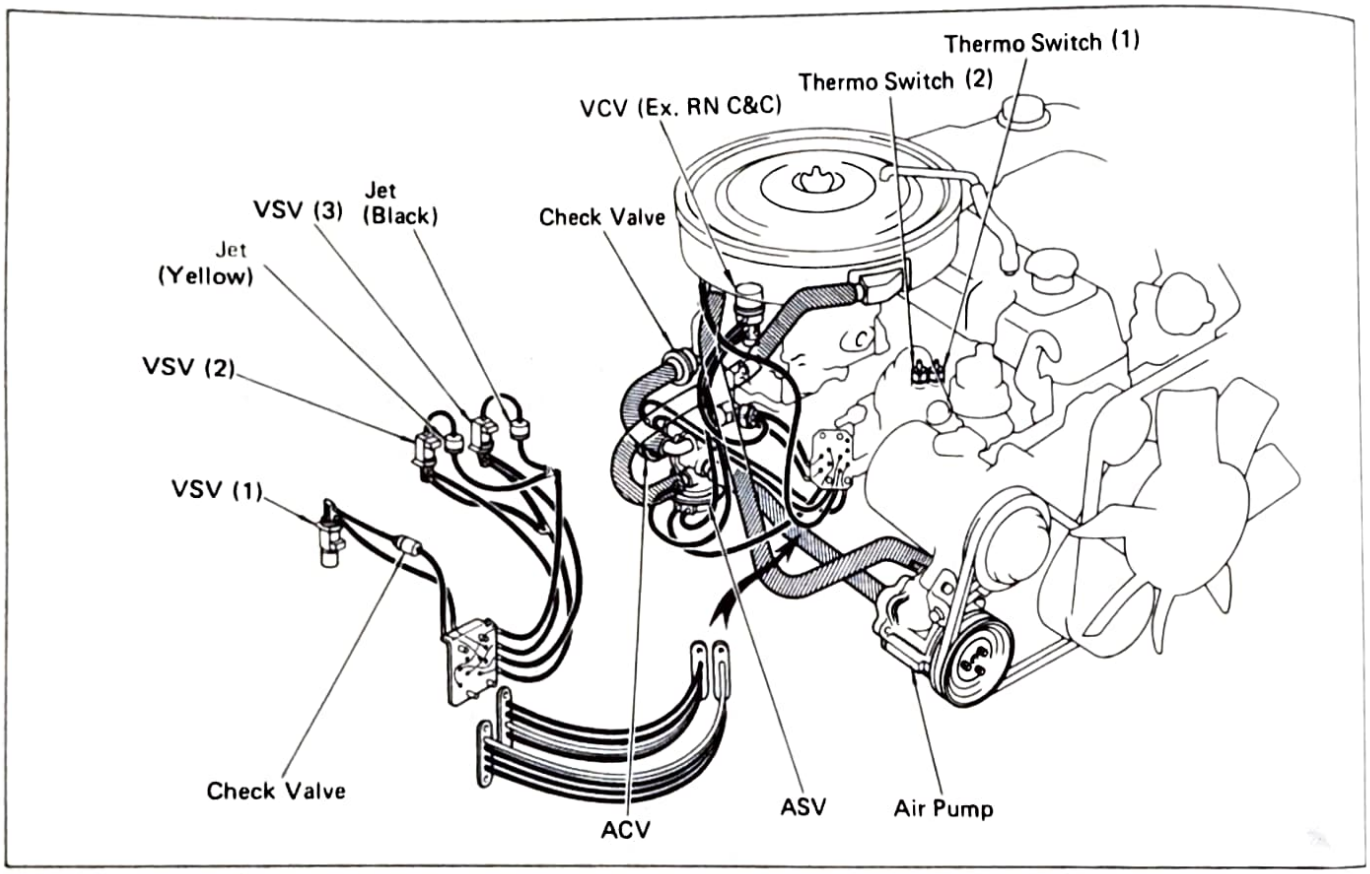
CHECK VTV BY BLOWING AIR INTO EACH SIDE

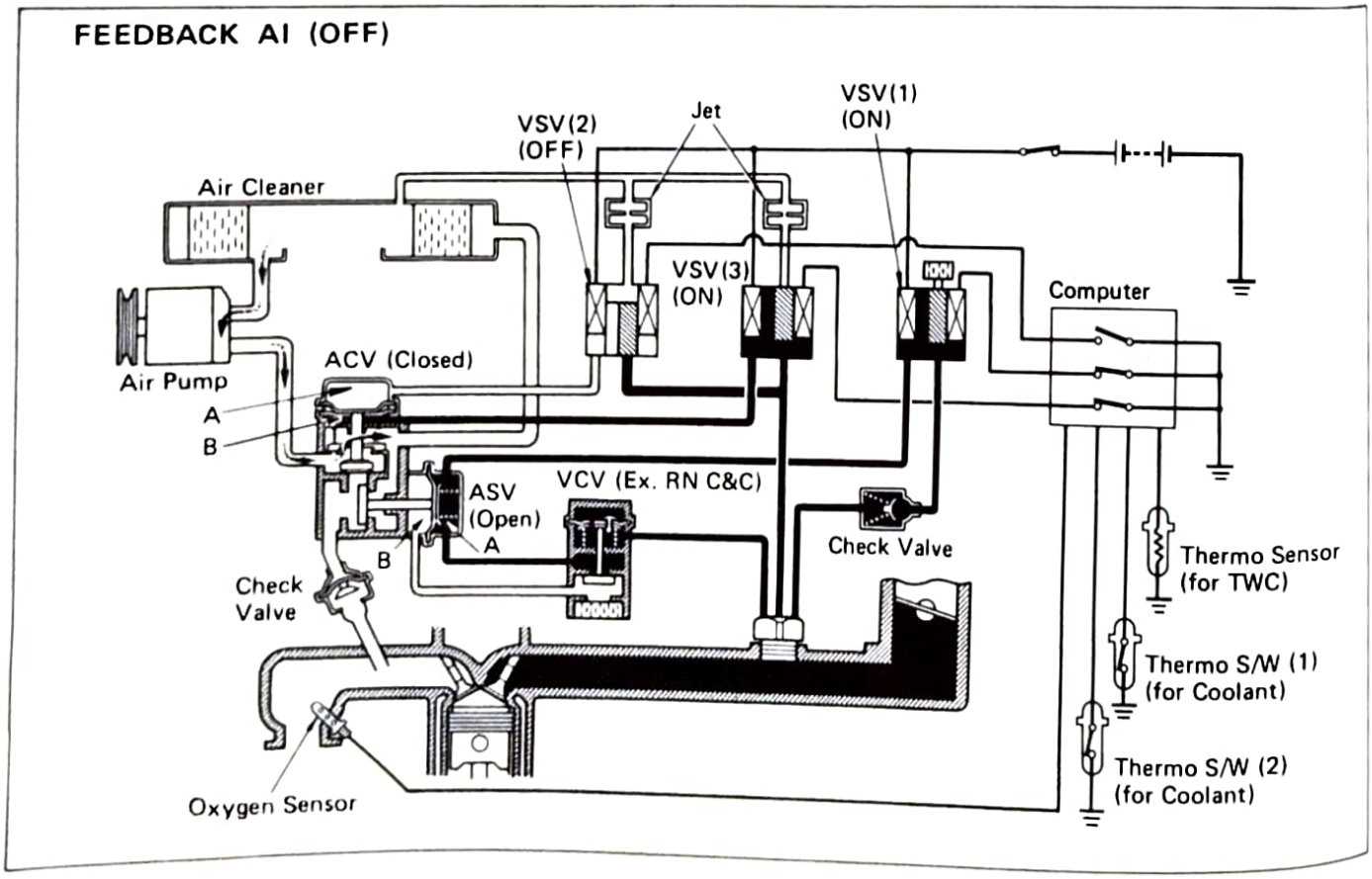
(a) Check that air flows without resistance from B to A.

(b) Check that air flows with difficulty from A to B.

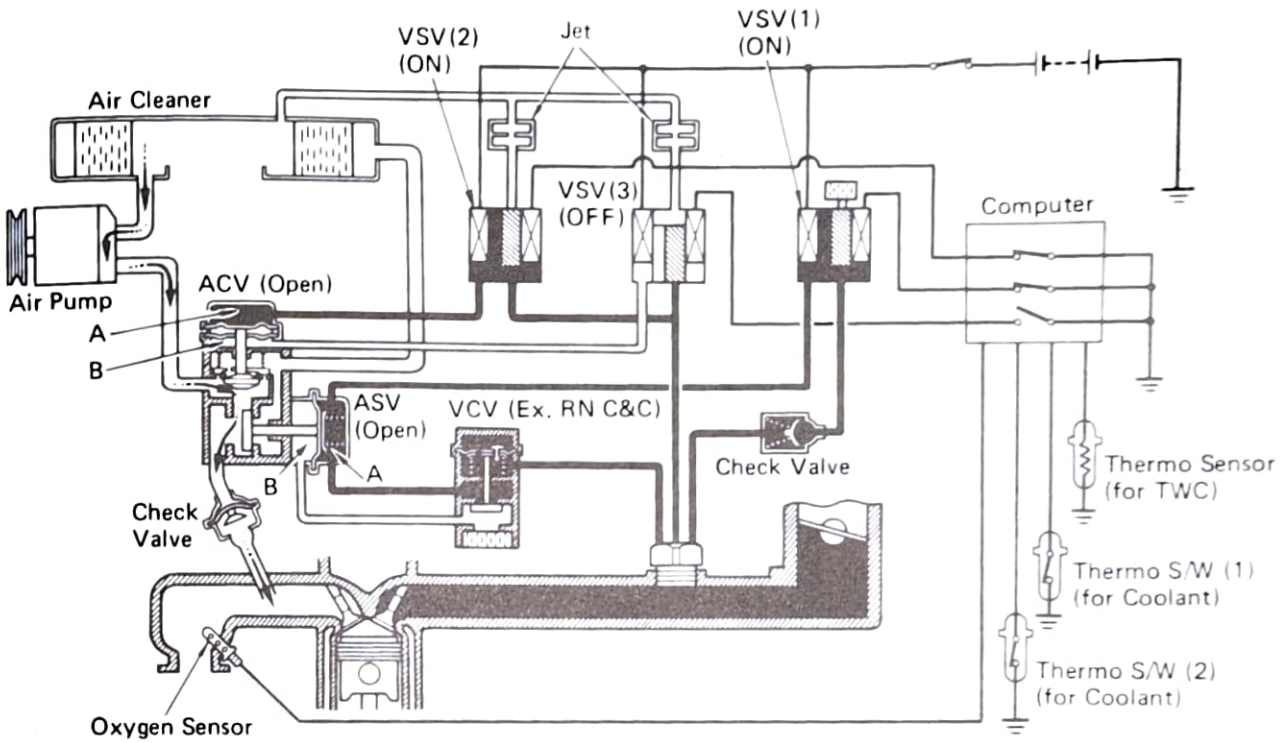
If a problem is found, replace the VTV.

Air Injection (AI) with Feedback System (Calif. RN and RN C&C)





FEEDBACK AI (ON)



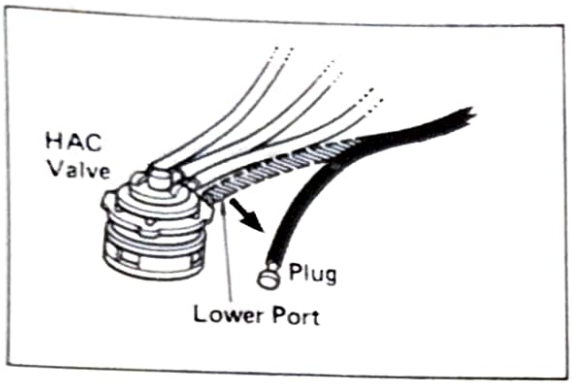
To oxidize and reduce HC, CO and NOx emissions efficiently in the TWC, this system maintains the air-fuel ratio of the inlet gas for the TWC stoichiometric by switching the compressed air from the air pump to either the exhaust ports or the air cleaner in response to the oxygen (O_2) concentration in the exhaust manifold.

AI Control by ASV	TWC Temp.	Coolant Temp. (Thermo S/W (1))	Vehicle Condition	Vacuum in VCV Chamber A and B	VSV (1)	ASV Chambers		ASV	AI
						Chamber A	Chamber B		
	Below 600°C (1,110°F)	Below 6°C (43°F)	—	—	OFF	Atmosphere	Atmosphere	CLOSED	Always OFF
		Between 18 – 98°C (64 – 208°F)	Except following condition	Same	ON	Vacuum	Atmosphere	OPEN	Controlled by ACV
			Sudden deceleration	High vacuum acts on chamber A	ON	Vacuum	Vacuum	CLOSED	Momentarily OFF
		Above 110°C (230°F)	—	—	OFF	Atmosphere	Atmosphere	CLOSED	Always OFF
	Above 785°C (1,445°F)	—	—	—	OFF	Atmosphere	Atmosphere	CLOSED	Always OFF

AI Control by ACV	Coolant Temp. (Thermo S/W (2))	Air-fuel Ratio for TWC	1) O_2 Sensor Signal	VSV		ACV Chambers		ACV	AI	
				(2)	(3)	Chamber A	Chamber B			
	Below 43°C (109°F)	—	—	ON	OFF	Vacuum	Atmosphere	OPEN	Always ON	
	Above 55°C (131°F)	RICH	RICH	ON	OFF	Vacuum	Atmosphere	OPEN	ON	2) Feedback AI
		LEAN	LEAN	OFF	ON	Atmosphere	Vacuum	CLOSED	OFF	

Remarks: 1) Signal of air-fuel ratio of the inlet gas for TWC.
2) By means of O_2 sensor, detects oxygen concentration in exhaust manifold after combustion. If air-fuel ratio is rich for TWC, turns AI ON. If lean, turns AI OFF.

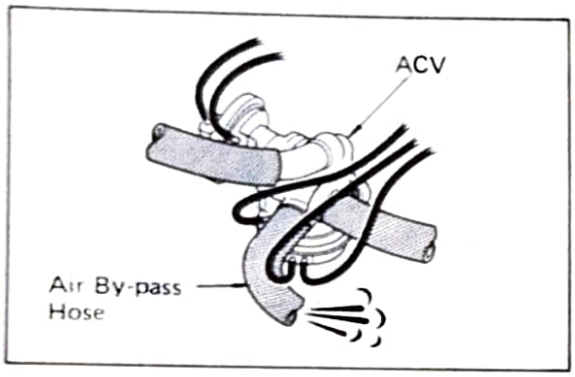
Air-fuel ratio RICH → Air injection ON → Air-fuel ratio LEAN → Air injection OFF



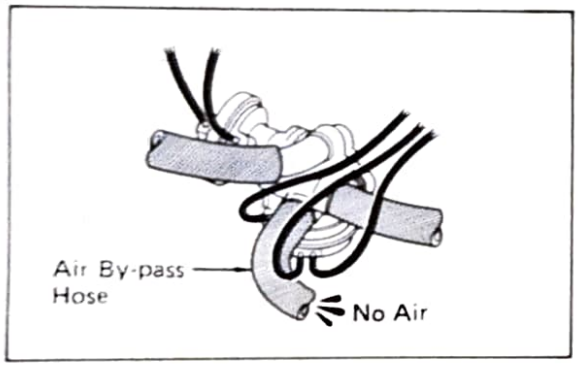
INSPECTION OF AI SYSTEM

1. VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTIONS

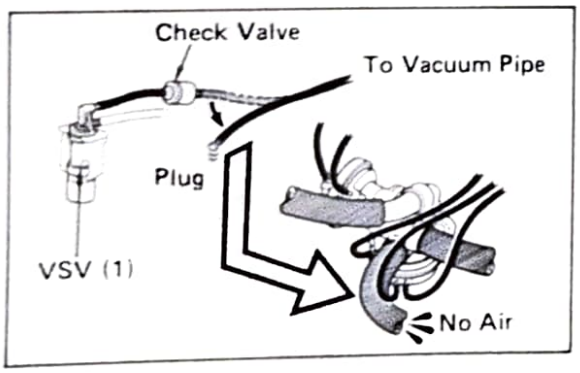
2. PREPARATION
   (a) Disconnect the air by-pass hose from the air cleaner.
   (b) (For vehicles with HAC system)
   Disconnect the vacuum hose from lower port of the HAC valve, and plug the hose end.



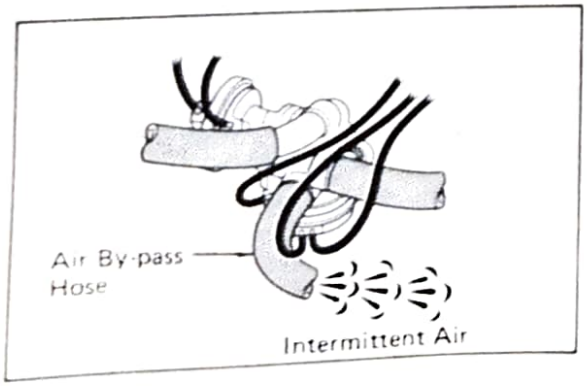
3. CHECK ASV WITH COLD ENGINE
   (a) The coolant temperature should be below 6°C (43°F).
   (b) Start the engine and check that air is discharged from the air by-pass hose.



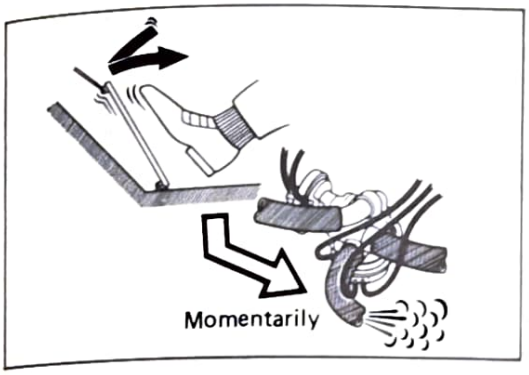
4. CHECK ASV AND ACV WITH WARM ENGINE (INCLUDING THERMO SWITCH (1) AND (2) TO VSVs)
   (a) Warm up the engine to between 18°C (64°F) and 43°C (109°F).
   (b) With the engine idling, check that air is **not** discharged from the air by-pass hose.



5. CHECK THE CHECK VALVE
   (a) Disconnect the vacuum hose between the check valve and vacuum pipe at the check valve side, and plug the hose end.
   (b) Check that air is not still discharged from the air by-pass hose.
   (c) Reconnect vacuum hose.

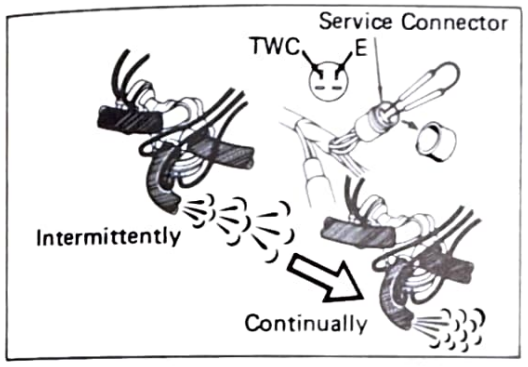


6. CHECK ACV AND VSVs (INCLUDING OXYGEN SENSOR TO VSVs)
   (a) Warm up the engine to normal operating temperature.
   (b) Maintain the engine speed at 2,000 rpm.
   (c) Check that air is discharged intermittently from the air by-pass hose.



7. CHECK VCV (EXCEPT RN C&C)

Race the engine and quickly close the throttle valve. Check that air is discharged momentarily from the air by-pass hose.



8. CHECK TWC THERMO SENSOR TO VSV(1)

(a) With the engine idling, connect a wire to the TWC terminal and E terminal of the service connector.

Service connector location: Corner of the left dash panel

(b) Check that the intermittent air from the air by-pass hose changes to a continuous discharge.

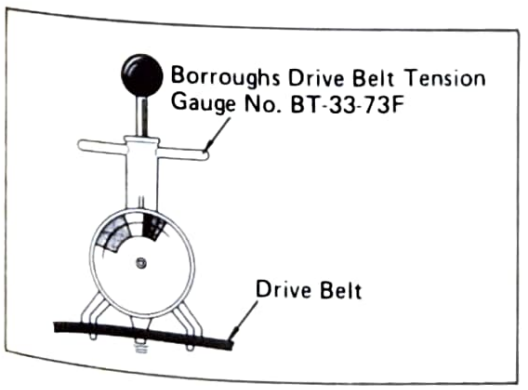
(c) Disconnect the wire from the service connector.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF AIR PUMP DRIVE BELT

1. VISUALLY CHECK DRIVE BELT FOR CRACKS, OILINESS OR WETNESS

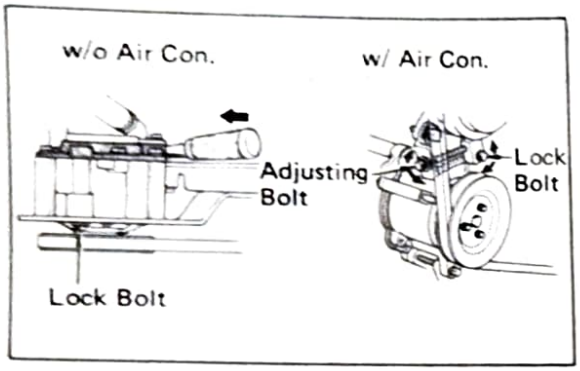
The belt should not touch the bottom of the pulley groove.



2. CHECK AND ADJUST DRIVE BELT TENSION

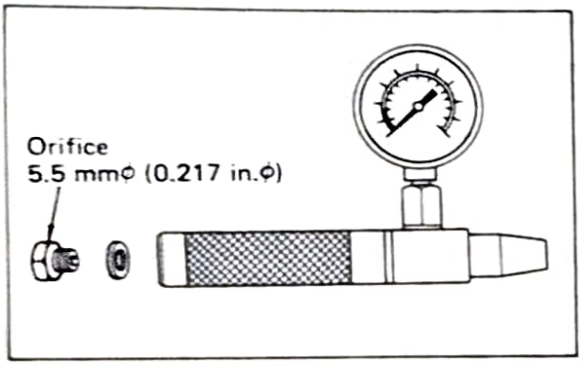
(a) Check the drive belt tension with Borroughs Drive Belt Tension Gauge No. BT-33-73F.

Belt tension: New belt 125 ± 25 lb
Used belt 80 ± 20 lb



(b) To adjust, loosen the adjusting lever bolt and pivot bolt, shift the air pump toward the direction of belt tension, and retighten the bolts.

CAUTION: Do not attempt to shift the air pump by prying the die cast part with a lever. Pry the rear cover when making the adjustment.



INSPECTION OF AIR PUMP

1. CHECK AIR PUMP FOR ABNORMAL NOISE

2. CHECK AIR PUMP DISCHARGE PRESSURE

(a) Connect the air pump tester (SST) to the hose at the air pump outlet.

SST 09258-14010

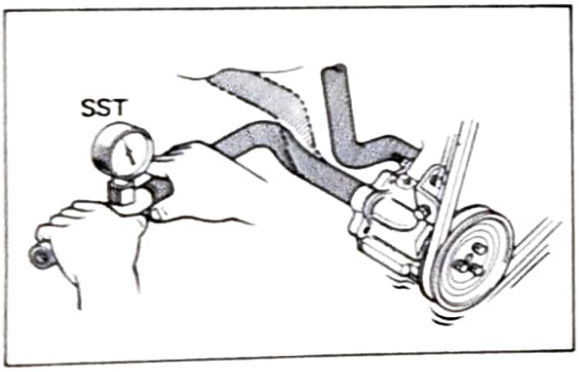
(b) Select and use a specified orifice (5.5 mm dia. or 0.217 in. dia.) on the SST.

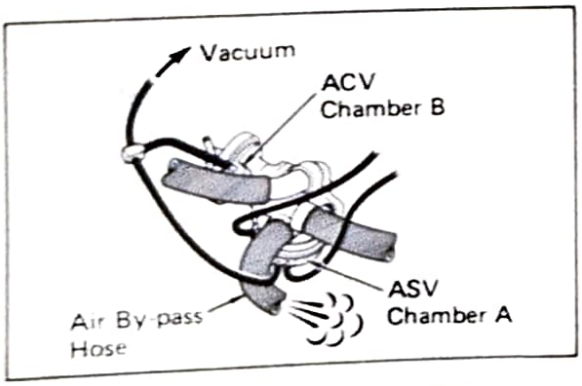
(c) Set the engine speed at 1,800 rpm.

(d) The gauge of the SST should indicate in the green zone.

If the SST indicates in the red zone, replace the pump assembly.

(e) Reconnect the hose to the proper location.





INSPECTION OF ACV

1. CHECK ACV AND ASV OPERATION

(a) Disconnect the air hose from the check valve, and air by-pass hose from the air cleaner.

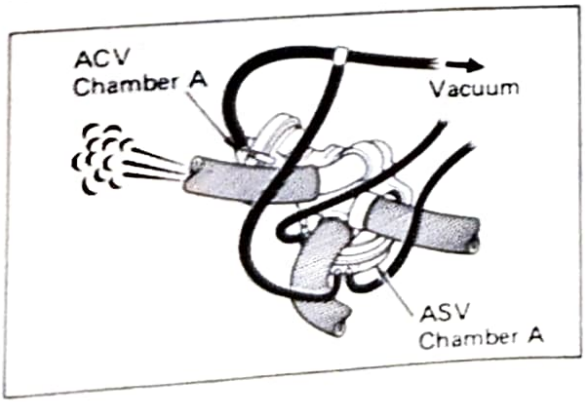
(b) Disconnect the vacuum hose between the ASV and vacuum pipe at the ASV side, and 2 vacuum hoses from the ACV, and plug the hose ends.

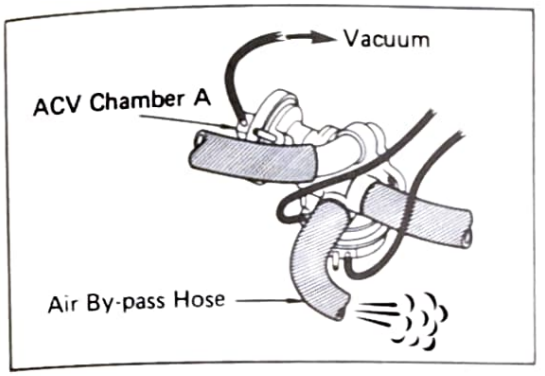
(c) With the engine idling, apply vacuum directly to the ACV chamber B and ASV chamber A.

(d) Check that compressed air comes out of the air by-pass hose at idle.

(e) Release the vacuum from ACV chamber B and apply vacuum directly to the ACV chamber A and ASV chamber A.

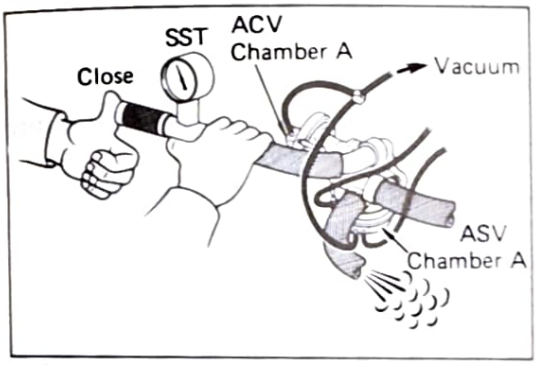
(f) Check that compressed air comes out of the air hose to the check valve at idle.





(g) Release the vacuum from the ASV chamber A and apply vacuum directly to the ACV chamber A.

(h) Check that compressed air comes out of the air by-pass hose at idle.



2. CHECK OPENING PRESSURE OF RELIEF VALVE

(a) Connect the air pump tester (SST) to the air hose to check valve.

SST 09258-14010

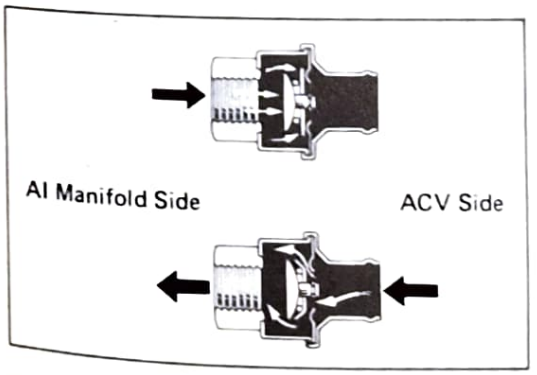
(b) Apply vacuum directly to the ACV chamber A and ASV chamber A.

(c) Close the orifice on the SST with your finger.

(d) Increase the engine speed gradually and measure the relief valve opening pressure.

Opening pressure: 0.35 – 0.44 kg/cm^2 (5.0 – 6.4 psi)

(e) Remove the SST and reconnect the air hoses and vacuum hoses to the proper locations.



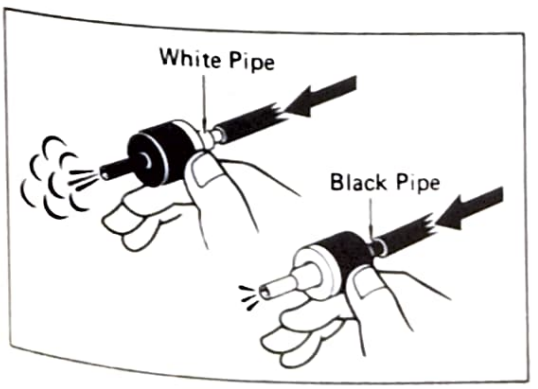
INSPECTION OF CHECK VALVE

CHECK VALVE BY BLOWING AIR FROM EACH SIDE

(a) Check that air does not flow from manifold side to ACV side.

(b) Check that air flows from ACV side to manifold side.

If a problem is found, replace the valve.

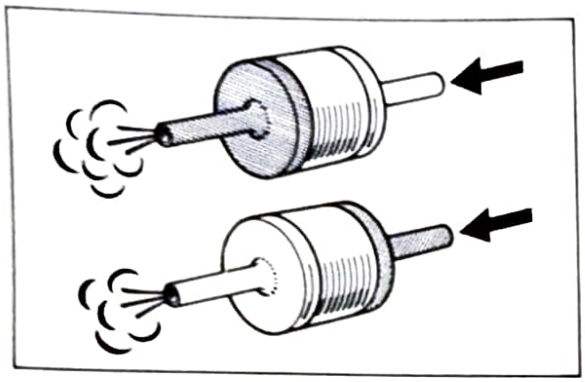


INSPECTION OF CHECK VALVE

CHECK VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from the white pipe to the black pipe.

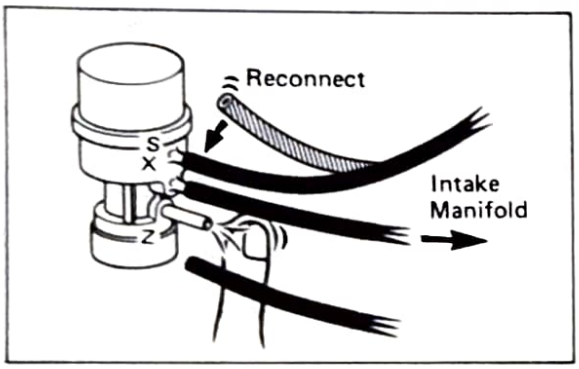
(b) Check that air does not flow from the black pipe to the white pipe.



INSPECTION OF JET

CHECK JET BY BLOWING AIR FROM EACH SIDE

Check for stoppage.



INSPECTION OF VCV (Except RN C&C)

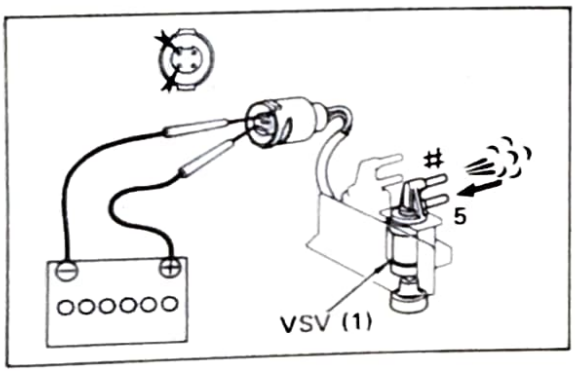
CHECK VCV OPERATION

(a) Disconnect the vacuum hose from port X of the VCV, and plug the hose end.

(b) Connect port X directly to the intake manifold with another hose, and disconnect the vacuum hose from port Z and port S of the VCV.

(c) With the engine idling, place your finger over port Z and check that vacuum is not felt.

(d) Check that vacuum is felt momentarily as the vacuum hose is reconnected to port S.

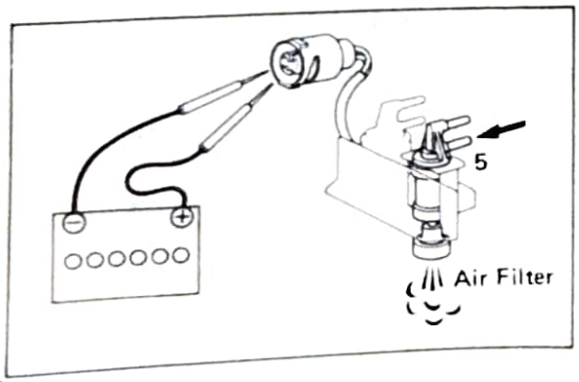


INSPECTION OF VSV (1)

1. CHECK VACUUM CIRCUIT CONTINUITY IN THE VSV(1) BY BLOWING AIR INTO PIPES

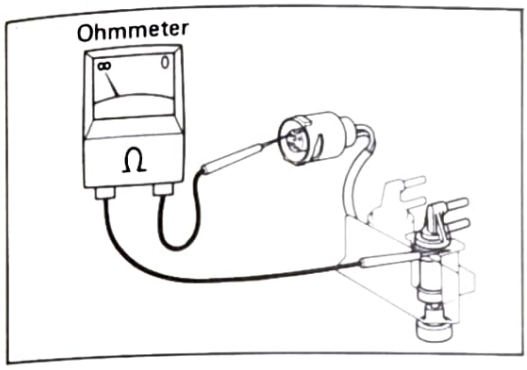
(a) Connect the VSV (1) terminals to the battery terminals as illustrated.

(b) Blow into pipe 5 and check that air comes out of pipe #.



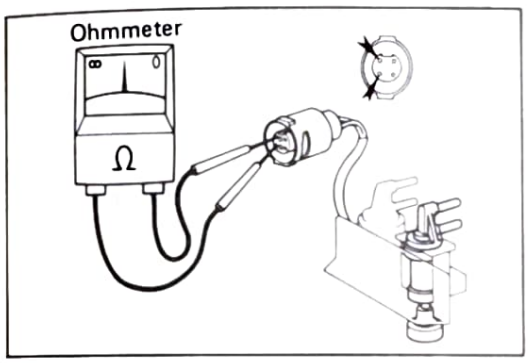
(c) Disconnect the battery.

(d) Blow into pipe 5 and check that air come out of the air filter.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV(1) body.



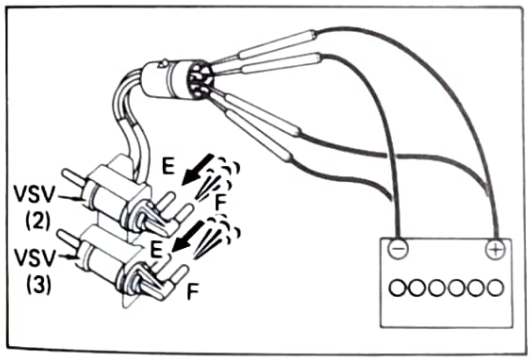
3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.

Specified resistance: 38 – 43 ohms at 20°C (68°F)

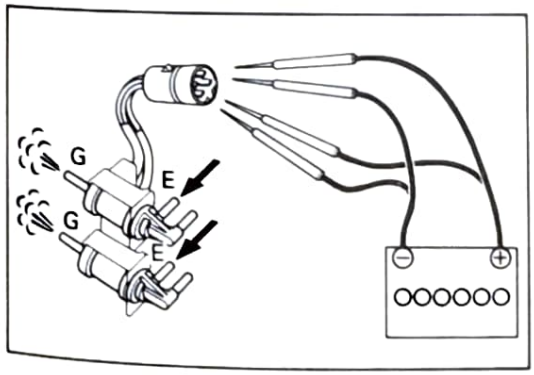
INSPECTION OF VSV (2) AND (3)

1. CHECK VACUUM CIRCUIT CONTINUITY IN THE VSV BY BLOWING AIR INTO PIPES



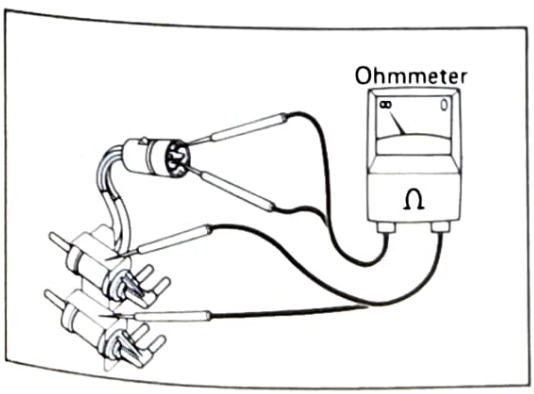
(a) Connect the VSV terminals to the battery terminals as illustrated.

(b) Blow into pipe E and check that air comes out of pipe F.



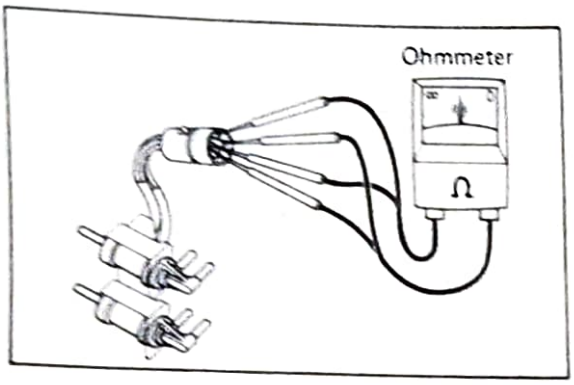
(c) Disconnect the battery.

(d) Blow into pipe E and check that air comes out of pipe G.



2. CHECK FOR SHORT CIRCUIT

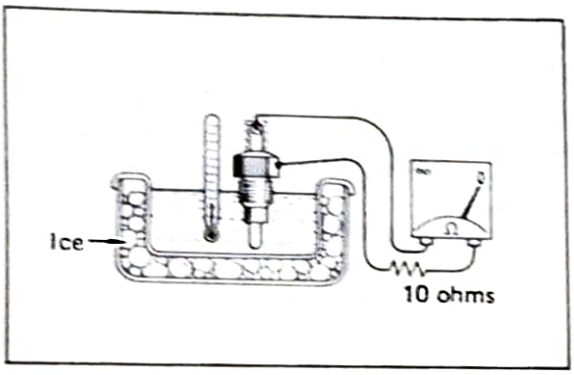
Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV body.



3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.

Specified resistance: 38 – 43 ohms at 20°C (68°F)



INSPECTION OF THERMO SWITCH (1)

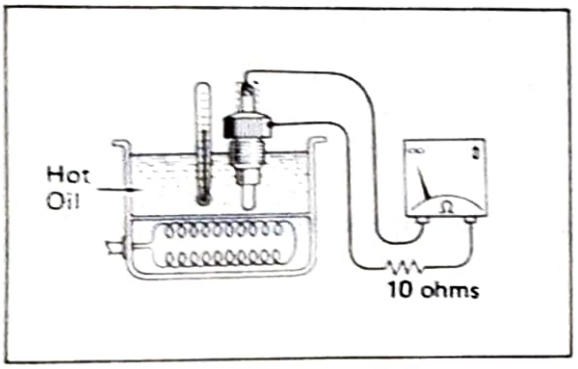
CHECK THERMO SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the thermo switch from the intake manifold.

(c) Cool the thermo switch to below 6°C (43°F).

(d) Using an ohmmeter, check that there is continuity.



(e) Heat the switch to 18 – 98°C (64 – 208°F) with hot oil.

(f) Check that there is no continuity.

(g) Heat the switch to above 110°C (230°F).

(h) Check that there is continuity.

(i) Apply liquid sealer to the threads of the switch and reinstall.

(j) Fill the radiator with coolant.

INSPECTION OF THERMO SWITCH (2)

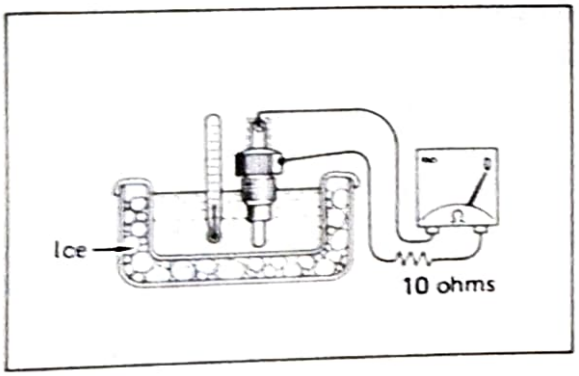
CHECK THERMO SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the thermo switch from the intake manifold.

(c) Cool the thermo switch to below 43°C (109°F).

(d) Using an ohmmeter, check that there is continuity.

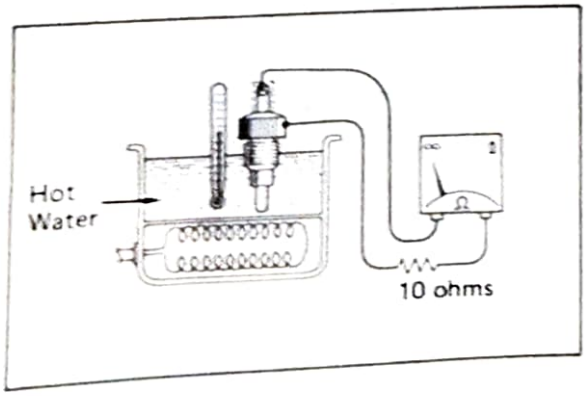


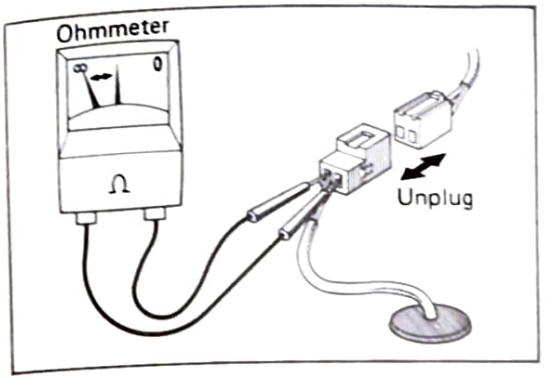
(e) Heat the switch to above 55°C (131°F) with hot water.

(f) Check that there is no continuity.

(g) Apply liquid sealer to the threads of the switch and reinstall.

(h) Fill the radiator with coolant.





INSPECTION OF TWC THERMO SENSOR

1. MEASURE RESISTANCE

(a) Unplug the wiring connector for thermo sensor under the driver's seat.

(b) Using an ohmmeter, measure the resistance between both terminals at idling.

Resistance: 2 – 200 kilohms

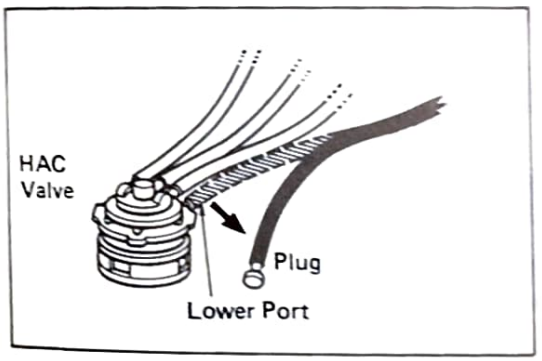
CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.

(c) Plug in the wiring connector.

2. CHECK SENSOR WIRING

(a) Look for damage.

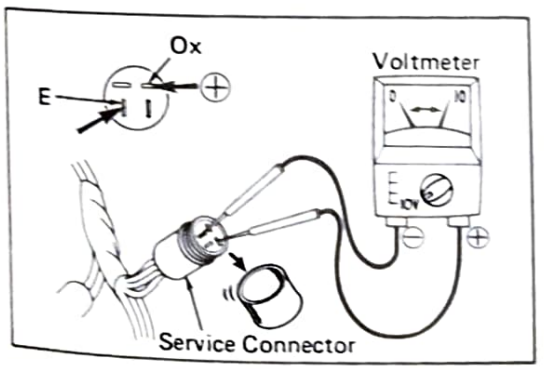
(b) Check for loose connections.



INSPECTION OF OXYGEN SENSOR

1. PREPARATION (FOR VEHICLE WITH HAC SYSTEM)

Disconnect the vacuum hose between the HAC valve and check valve at the check valve side, and plug the check valve.



2. CHECK OXYGEN SENSOR

(a) Warm up the engine to normal operating temperature.

(b) Connect the voltmeter to the service connector.

Service connector location: Corner of the left dash panel

Connect the (+) testing probe to the Ox terminal and (-) testing probe to the E terminal.

(c) Race the engine at 2,500 rpm for about 90 seconds.

(d) Maintain the engine speed at 2,500 rpm.

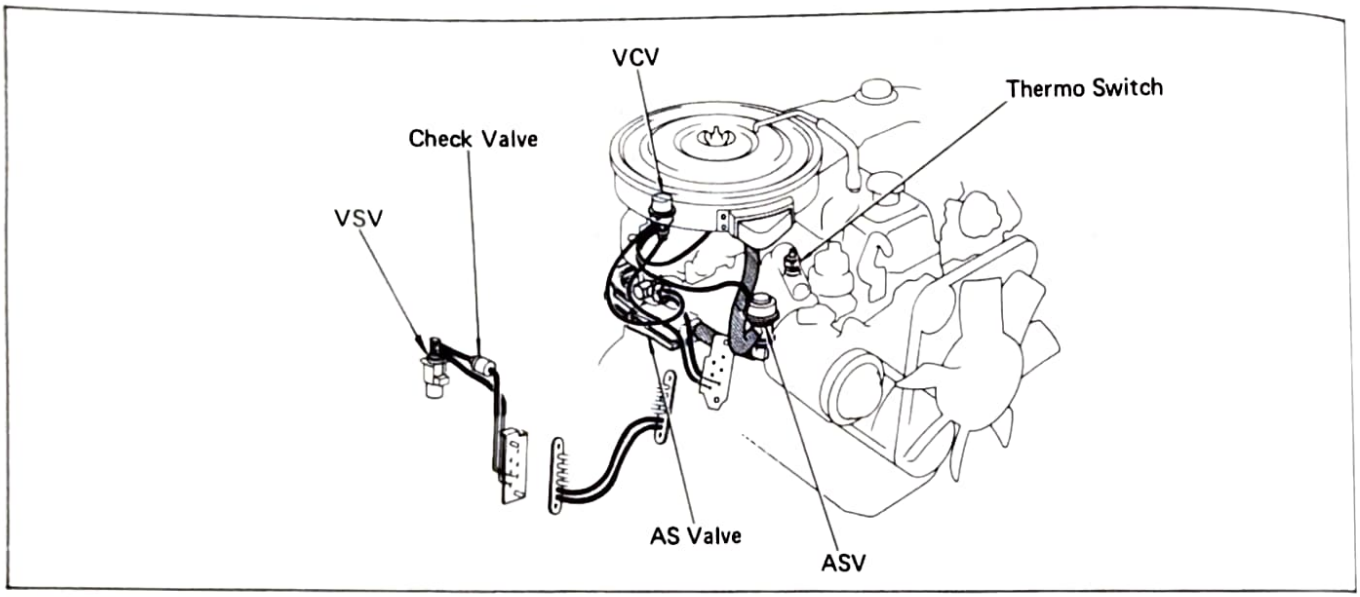
(e) Check that the needle of the voltmeter fluctuates 8 times or more in 10 seconds with 0 – 7 volts.

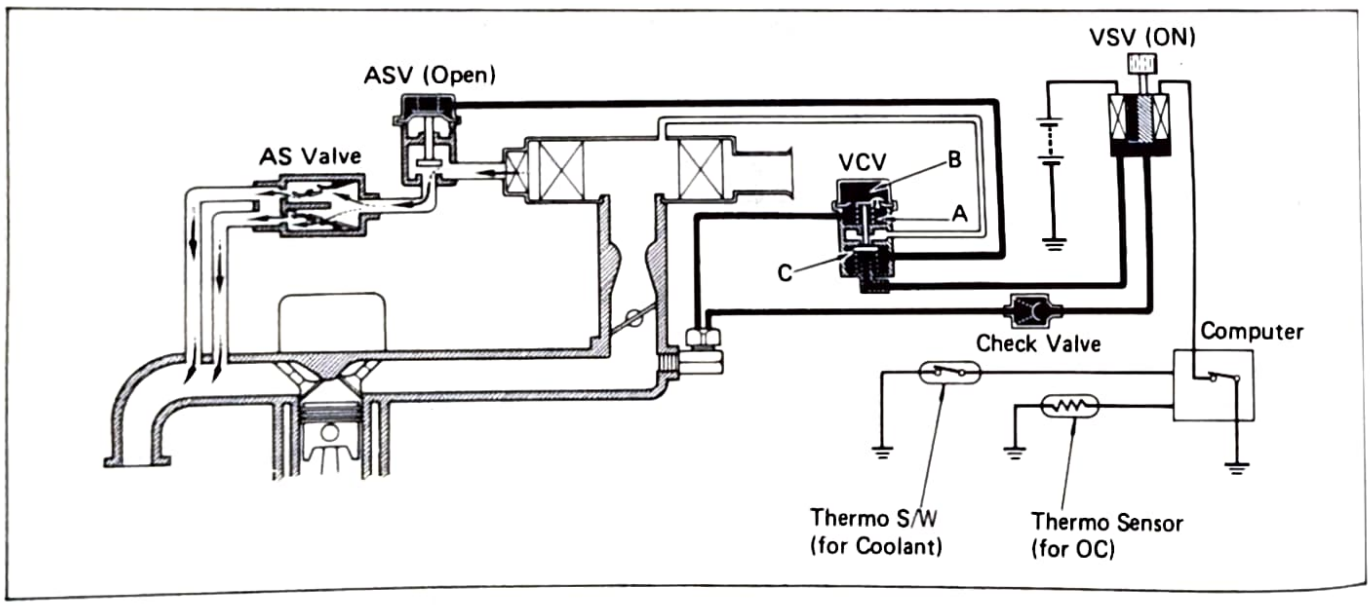
3. RECONNECT VACUUM HOSE TO PROPER LOCATION (FOR VEHICLE WITH HAC SYSTEM)

NOTE:

- If this test is positive, oxygen sensor is OK.
- If not, inspect the other parts, hose connections and wiring of AI system. (See from page 3-66.)
  If no problem found, replace oxygen sensor.

Air Suction (AS) System (Fed. RN and Canada RN 4×2 (except RN C&C))





To reduce HC and CO emissions, this system draws in air into all exhaust ports to accelerate oxidation using vacuum generated by the exhaust pulsation in the exhaust manifold.

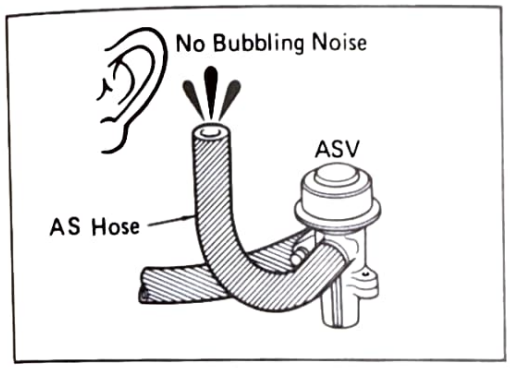
TWC Temp.	Coolant Temp.	Computer	VSV	Condition	Vacuum in VCV Chamber A and B	VCV Valve C	ASV	AS
Below 600°C (1,110°F)	Below 6°C (43°F)	OFF	OFF	—	—	—	CLOSED	OFF
	Between 18 – 98°C (64 – 208°F)	ON	ON	Constant RPM	Same	CLOSED	OPEN	ON
				Sudden Deceleration	*High vacuum acts on chamber A	OPEN	CLOSED	Momentarily OFF
	Above 98°C (208°F)	OFF	OFF	—	—	—	CLOSED	OFF
Above 785°C (1,445°F)	—	OFF	OFF	—	—	—	CLOSED	OFF

Remarks: *After a few seconds, vacuum in both chambers of the VCV equalize through the orifice.

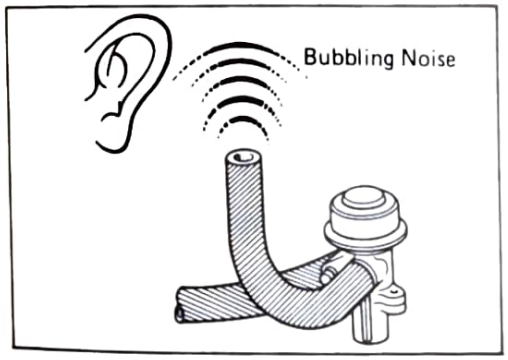
INSPECTION OF AS SYSTEM

1. VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTIONS

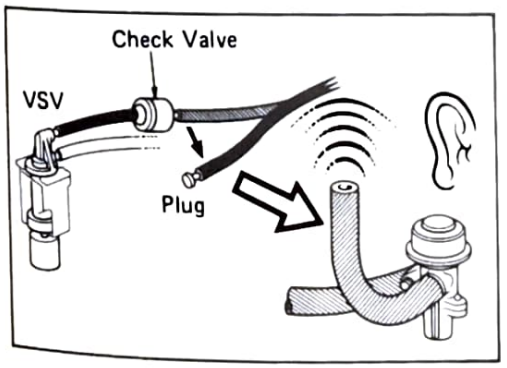
2. DISCONNECT AIR SUCTION HOSE FROM AIR CLEANER



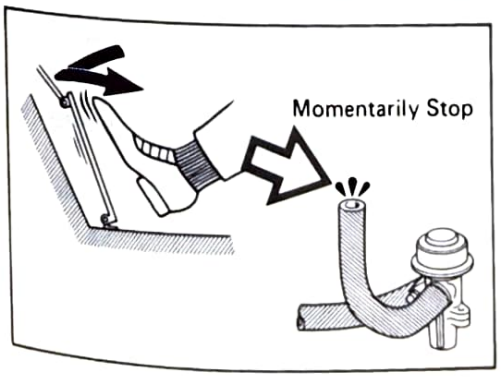
3. CHECK ASV WITH COLD ENGINE
   (a) The coolant temperature should be below 6°C (43°F).
   (b) Check that a bubbling noise is not heard from the AS hose at idle.



4. CHECK ASV WITH HOT ENGINE (INCLUDING THERMO SWITCH TO VSV)
   (a) Warm up the engine.
   (b) Check that a bubbling noise is heard from the AS hose at idle.

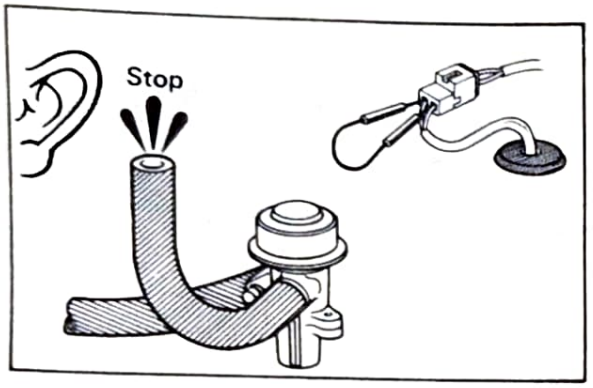


5. CHECK THE CHECK VALVE
   (a) Disconnect the vacuum hose between the check valve and vacuum pipe bracket at the check valve side, and plug the hose end.
   (b) Check that a bubbling noise is still heard from the AS hose at idle.
   (c) Reconnect vacuum hose.



6. CHECK VCV

   Race the engine and quickly close the throttle valve. Check that a bubbling noise stops momentarily.



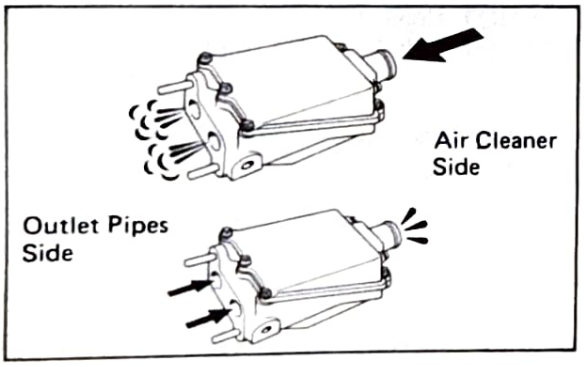
7. CHECK OC THERMO SENSOR TO VSV

(a) With the engine idling, connect a wire to both terminals of the OC thermo sensor.

(b) Check that a bubbling noise stops.

(c) Disconnect the wire from the OC thermo sensor terminals.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

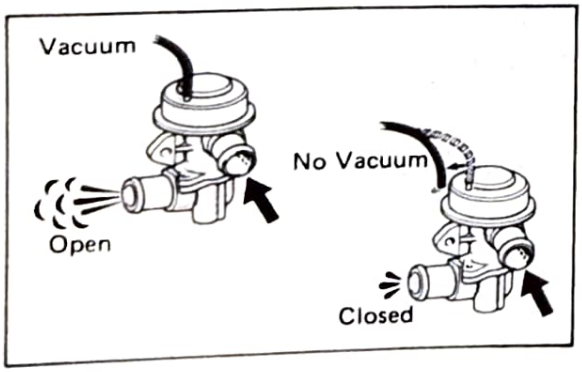


INSPECTION OF AIR SUCTION VALVE

CHECK AIR SUCTION VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from air cleaner side to outlet pipes side.

(b) Check that air does not flow from outlet pipes side to air cleaner side.



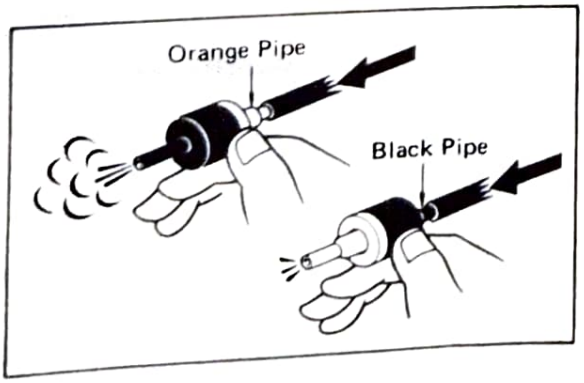
INSPECTION OF ASV

CHECK ASV BY BLOWING AIR INTO PIPE

(a) Apply vacuum to the ASV diaphragm.

(b) Blow air into a pipe and check that the ASV is open.

(c) Release the vacuum and check that the ASV is closed.

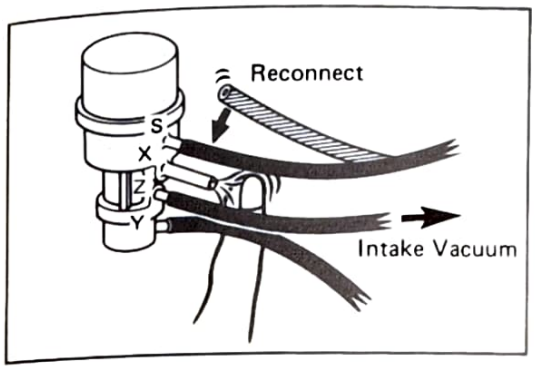


INSPECTION OF CHECK VALVE

CHECK VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow from the black pipe to the orange pipe.



INSPECTION OF VCV

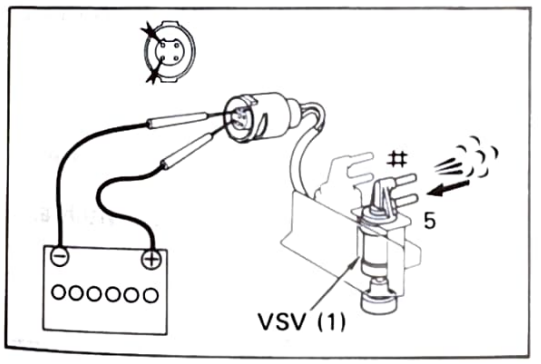
CHECK VCV OPERATION

(a) Disconnect the vacuum hose from port Z of the VCV.

(b) Connect port Z directly to the intake manifold with another hose, and disconnect the vacuum hose from port S and X of the VCV.

(c) With the engine idling, place your finger over port X and check that vacuum is not felt.

(d) Check that vacuum is felt momentarily as the vacuum hose is reconnected to port S.

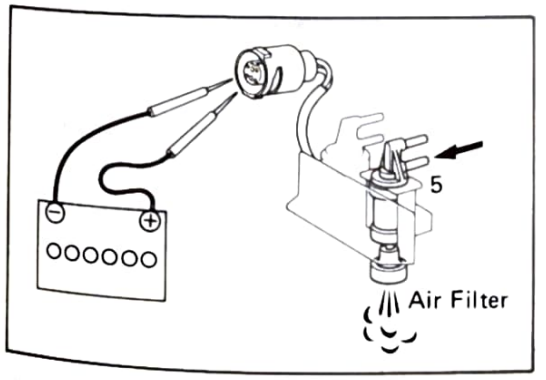


INSPECTION OF VSV

1. CHECK VACUUM CIRCUIT CONTINUITY IN THE VSV BY BLOWING AIR INTO PIPE

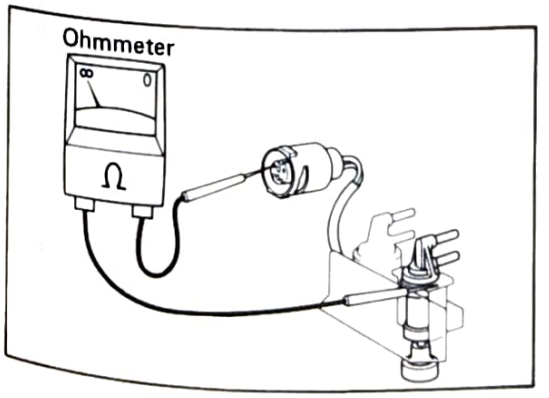
(a) Connect the VSV terminals to the battery terminals as illustrated.

(b) Blow into pipe 5 and check that air comes out of pipe #.



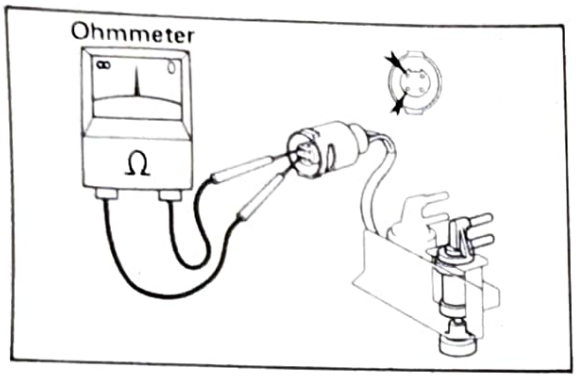
(c) Disconnect the battery.

(d) Blow into pipe 5 and check that air come out of the air filter.



2. CHECK FOR SHORT CIRCUIT

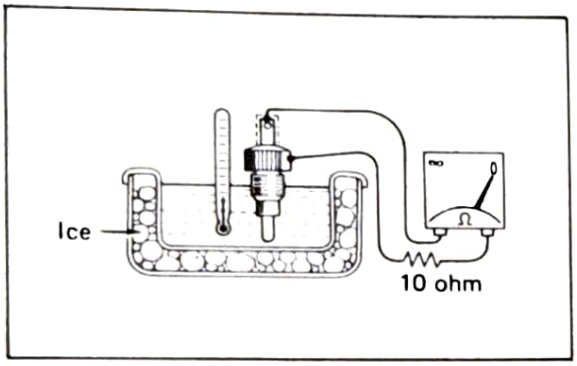
Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV (1) body.



3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.

Specified resistance: 38 – 43 ohms at 20°C (68°F)



INSPECTION OF THERMO SWITCH

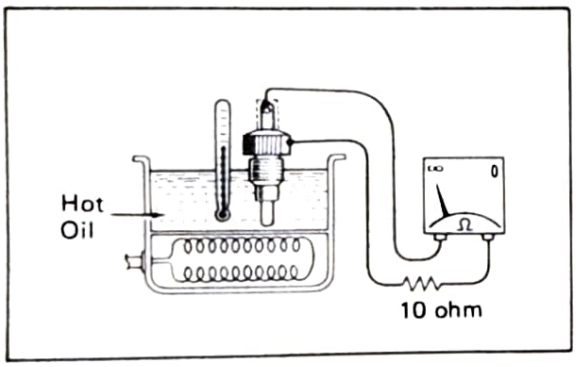
CHECK THERMO SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the thermo switch from the intake manifold.

(c) Cool the thermo switch to below 6°C (43°F).

(d) Using an ohmmeter, check that there is continuity.



(e) Heat the switch to 18 – 98°C (64 – 208°F) with hot oil.

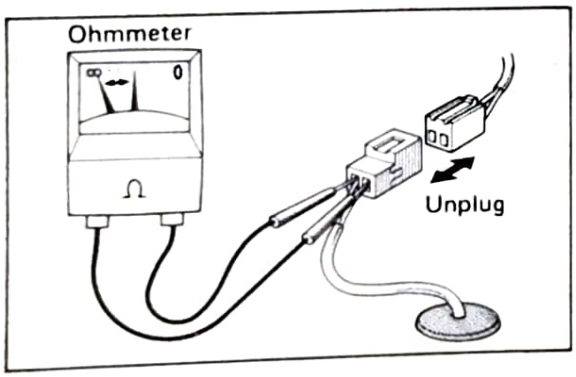
(f) Check that there is no continuity.

(g) Heat the switch to above 110°C (230°F).

(h) Check that there is continuity.

(i) Apply liquid sealer to the threads of the switch and reinstall.

(j) Fill the radiator with coolant.



INSPECTION OF OC THERMO SENSOR

1. MEASURE RESISTANCE

(a) Unplug the wiring connector for thermo sensor under the driver's seat.

(b) Using an ohmmeter, measure the resistance between both terminals at idling.

Resistance: 2 – 200 kilohms

CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.

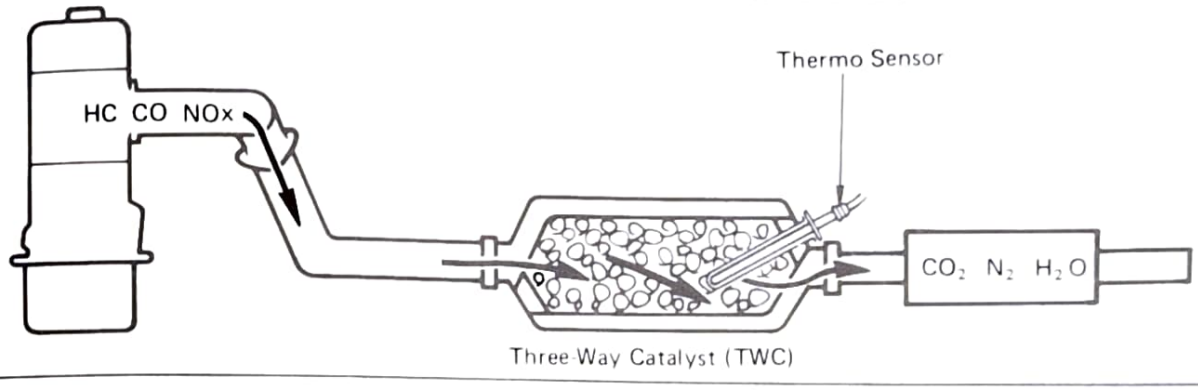
(c) Plug in the wiring connector.

2. CHECK SENSOR WIRING

(a) Look for damage.

(b) Check for loose connections.

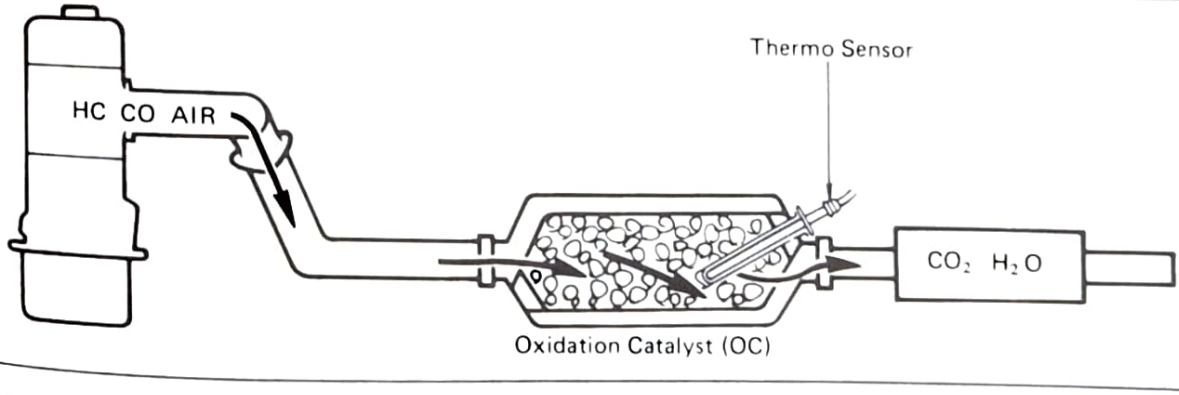
Three-Way Catalyst (TWC) System (Calif.RN and RN C&C)



- To reduce HC, CO and NOx emissions, they are oxidized and converted to dinitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.
- If the catalyst is overheated (above 785°C or 1,445°F), the thermo sensor in the catalytic converter turns the AI system OFF.

Exhaust Port		Converter		Exhaust Gas
UNBURNT HC, CO AND NOx (Proper Temperature)	→	OXIDATION AND REDUCTION (Temperature is increased.)	→	CO_2 H_2O N_2

Oxidation Catalyst (OC) System (Fed. RN and Canada RN 4×2 (except RN C&C)

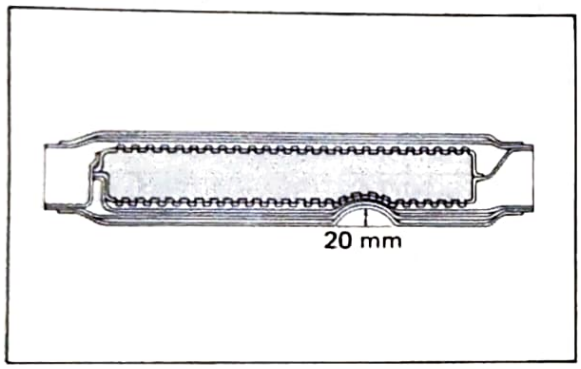


- To reduce HC and CO emissions, HC and CO are oxidized and converted to water (H_2O) and carbon dioxide (CO_2) by the catalyst.
- If the catalyst is overheated (above 785°C or 1,445°F), the thermo sensor in the catalytic converter turns the AS system OFF.

Exhaust Port		Converter		Exhaust Gas
UNBURNT HC, CO AND AIR (Proper Temperature)	→	OXIDATION (Temperature is increased.)	→	CO_2 H_2O

INSPECTION OF EXHAUST PIPE ASSEMBLY

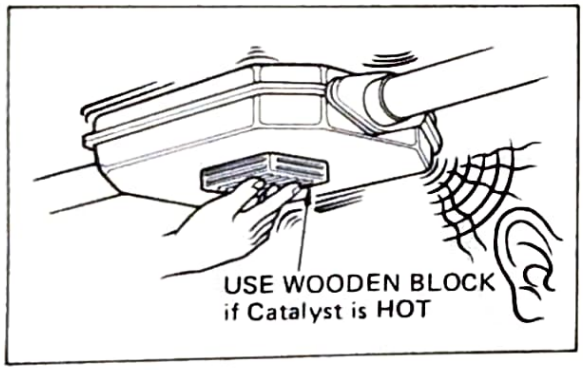
1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE



INSPECTION OF CATALYTIC CONVERTER

1. CHECK OUTER SURFACE FOR DENTS OR DAMAGE

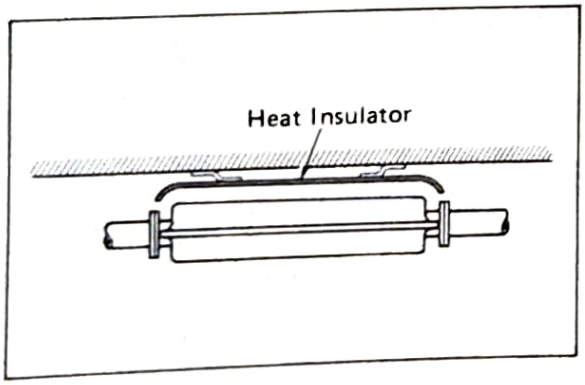
   Dent limit: 20 mm (0.79 in.)



2. SHAKE CATALYTIC CONVERTER, AND CHECK FOR EXCESSIVE RATTLING

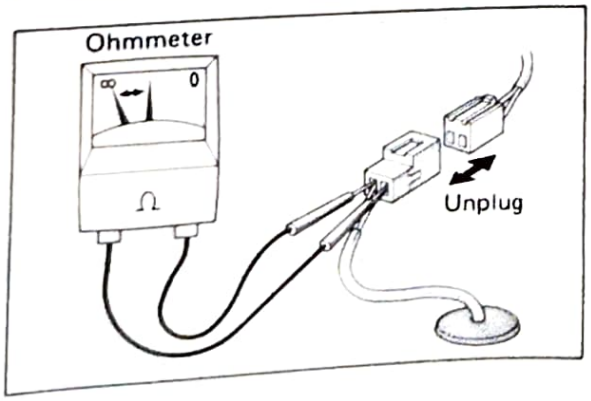
   If there is an excessive rattling noise, replace the converter.

INSPECTION OF HEAT INSULATOR



1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

INSPECTION OF THERMO SENSOR

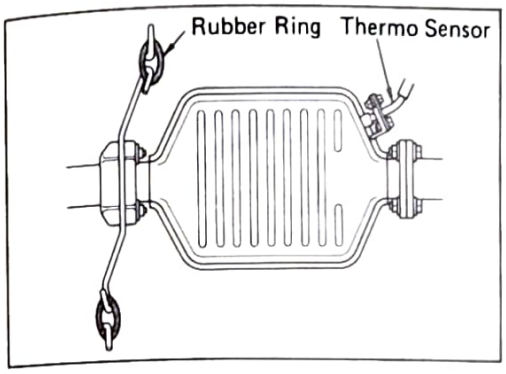


1. MEASURE RESISTANCE
   (a) Unplug the wiring connector.
   (b) Using an ohmmeter, measure the resistance between both terminals at idling.

   Resistance: 2 – 200 kilohms

   CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.

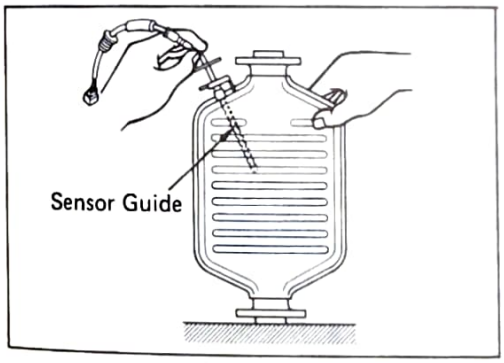
   (c) Plug in the wiring connector.
2. CHECK SENSOR WIRING
   (a) Look for damage.
   (b) Check that connections are tight.



REPLACEMENT OF CATALYTIC CONVERTER

1. REMOVE CATALYTIC CONVERTER WITH THERMO SENSOR
   (a) Unplug the thermo sensor wiring connector inside the vehicle (Under the driver's seat).
   (b) Remove the wiring grommet from the floor and pull the connector from the interior.
   (c) Jack up the vehicle.
   (d) Check that the converter is cool.
   (e) Remove the bolts at the front and rear of the converter.
   (f) Remove the rubber rings.
   (g) Remove the converter and gaskets.

2. REMOVE THERMO SENSOR
   (a) Hold the converter with the thermo sensor positioned upward.
   (b) Remove the thermo sensor and gasket from the converter.

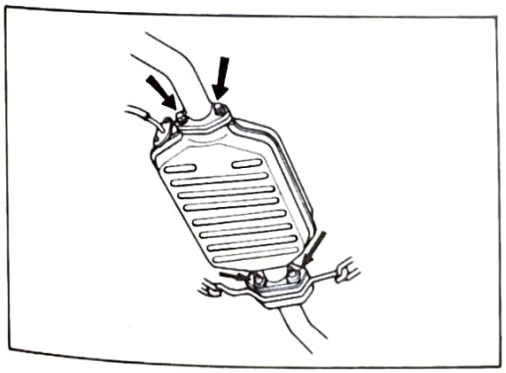


3. INSTALL THERMO SENSOR
   (a) Place a new gasket on the thermo sensor.

   NOTE: Service replacement converters are fitted with a plastic thermo sensor guide. Insert the sensor into this guide.

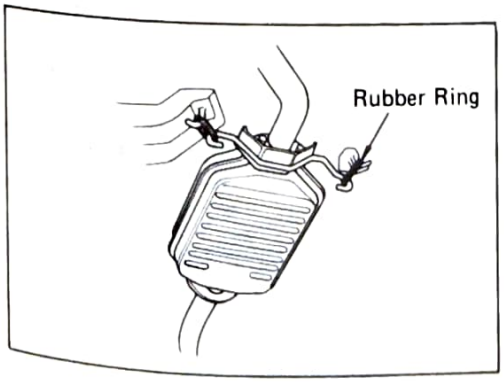
   (b) Push the sensor into the converter and tighten two bolts.

   Torque: 0.6 – 0.9 kg-m (53 – 78 in.-lb)



4. INSTALL CATALYTIC CONVERTER WITH THERMO SENSOR
   (a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.
   (b) Tighten the bolts.

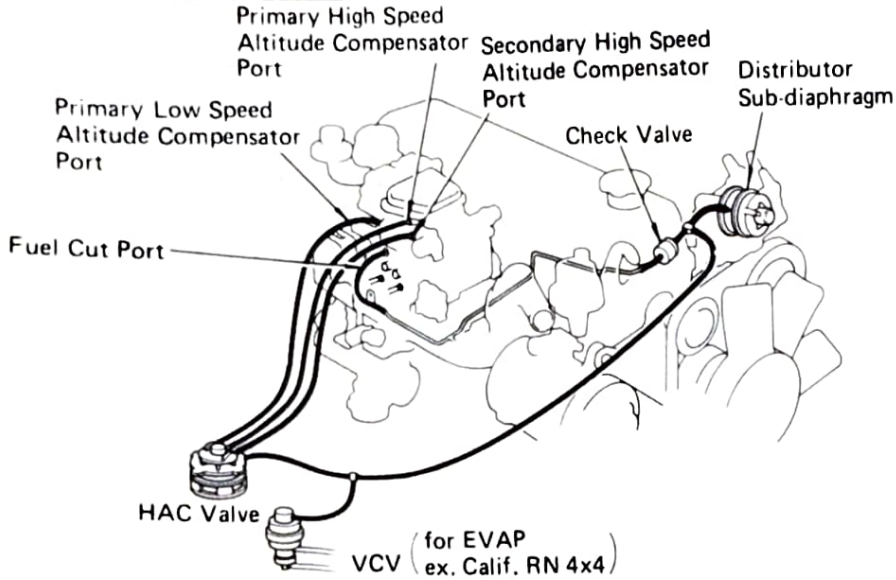
   Torque: 3.5 – 4.5 kg-m (26 –32 ft-lb)

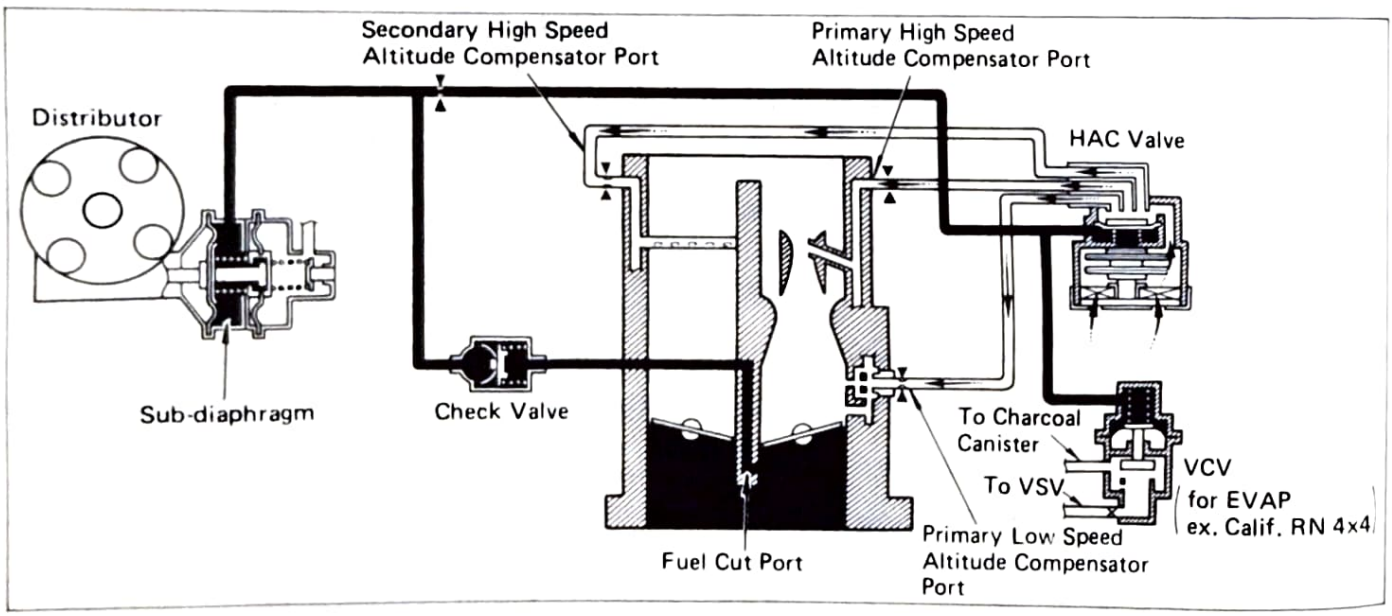


   (c) Secure the converter to the body with the rubber rings.
   (d) Plug in the thermo sensor connector, and install the floor grommet.

   NOTE: After installing, check the sensor wire to see that it is not excessively bent and that it is not interfering with other parts.

High Altitude Compensation (HAC) System (Calif. RN 4×4, RN C&C, and Fed. Vehicle (OPT))

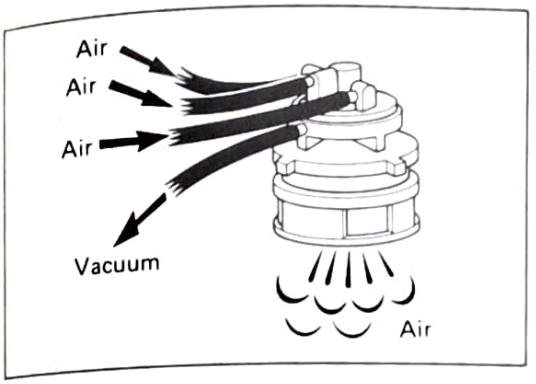




As altitude increases, the air-fuel mixture becomes richer. This system insures proper air-fuel mixture by supplying additional air to the primary low and high speed circuits and secondary high speed circuits of the carburetor, and advances the ignition timing to improve driveability at high altitude (above 1,198 m (3,930 ft)).

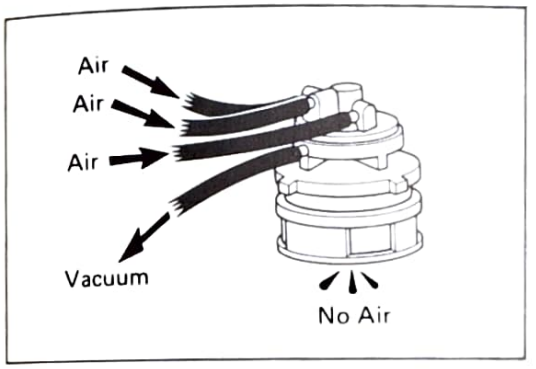
Altitude	Bellows in HAC Valve	Port A in HAC Valve	Distributor sub-diaphragm	Port C in VCV	*Evaporated Fuel (HC)	Port B in HAC Valve	Air from HAC Valve	Vacuum Ignition Timing
HIGH Above 1,198m (3,930 ft)	EXPANDED	CLOSED	PULLED (Always)	OPEN	HC from Canister is compensated to intake manifold	OPEN	Led into primary low and high speed circuits and secondary high speed circuits	ADVANCED (+7°) (Always)
LOW Below 783m (2,570 ft)	CONTRACTED	OPEN	PULLED (only during idling)	CLOSED	HC from Canister is led into the intake manifold	CLOSED	STOPPED	ADVANCED (+7°) (Only during idling)

Remarks: * Refer to page 3-46 of Fuel Evaporative Emission (EVAP) System.



INSPECTION OF HAC SYSTEM

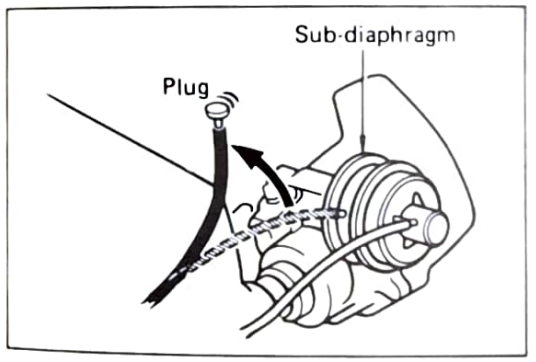
PRECHECK:
Before checking the HAC system, determine the position of the HAC valve. This can be done by blowing into any one of the three ports on top of the HAC valve with the engine idling. If the passage is open, the valve is in the HIGH ALTITUDE position.



If it is closed, the valve is in the LOW ALTITUDE position. (See page 3-86.)

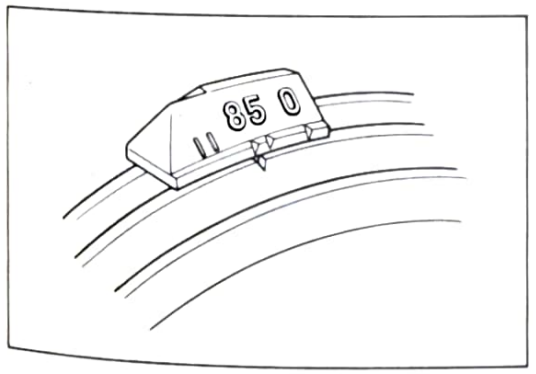
A. AT HIGH ALTITUDE

1. CHECK IGNITION TIMING AT IDLE



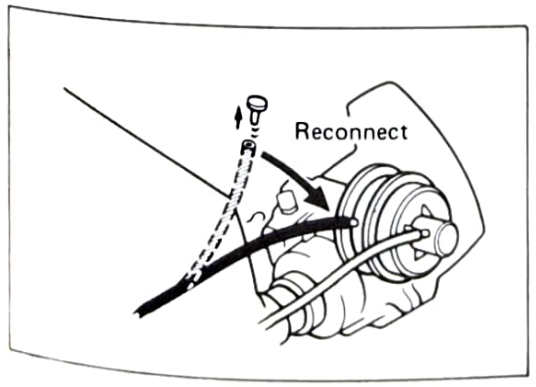
(a) Warm up the engine.

(b) Disconnect the hose from the distributor sub-diaphragm, and plug the hose end.

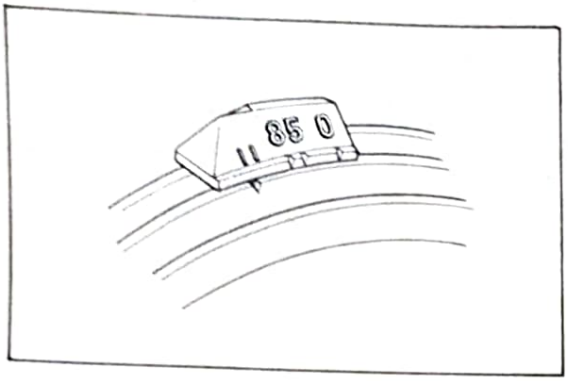


(c) Check the ignition timing.

Ignition timing: 8° BTDC

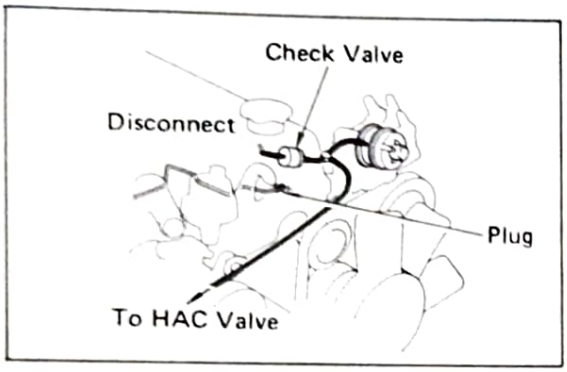


(d) Reconnect the hose to the sub-diaphragm.



(e) Check that the ignition timing advances.

Ignition timing: About 15° BTDC

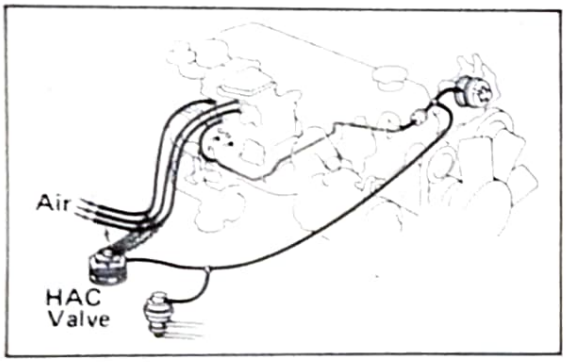


2. CHECK THE CHECK VALVE

(a) Disconnect the vacuum hose between the check valve and vacuum pipe at the vacuum pipe side, and plug the pipe end.

(b) Check that the ignition timing remains stationary for more than one minute.

(c) Stop the engine and reconnect the hose to the vacuum pipe.



3. CHECK CARBURETOR

(a) Disconnect three hoses from the pipes on top of the HAC valve.

(b) Blow air into each hose and check that air flows into the carburetor.

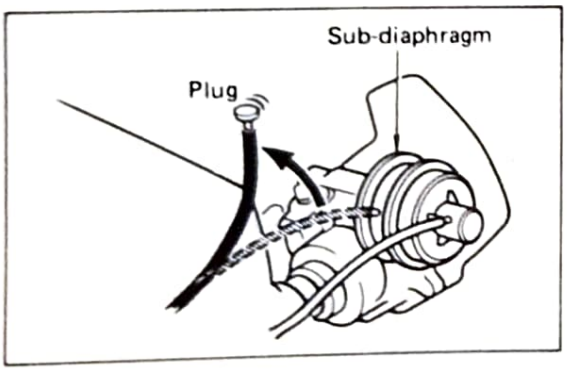
(c) Reconnect the hoses to the proper locations.

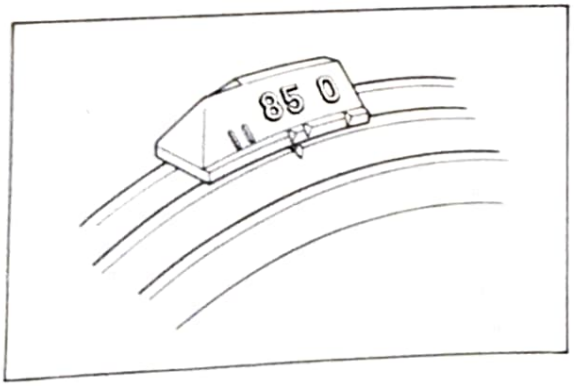
B. AT LOW ALTITUDE

1. CHECK IGNITION TIMING AT IDLE

(a) Warm up the engine.

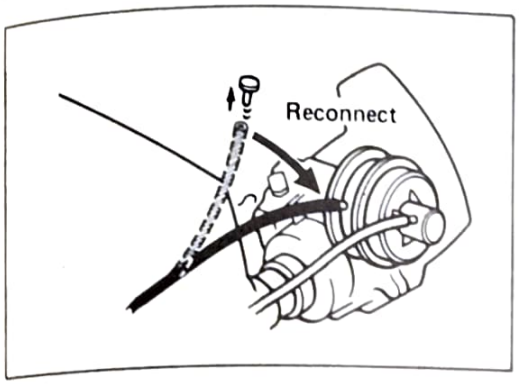
(b) Disconnect the hose from the distributor sub-diaphragm, and plug the hose end.



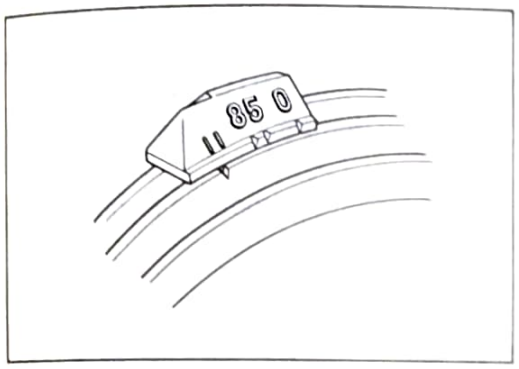


(c) Check the ignition timing.

Ignition timing: 8° BTDC

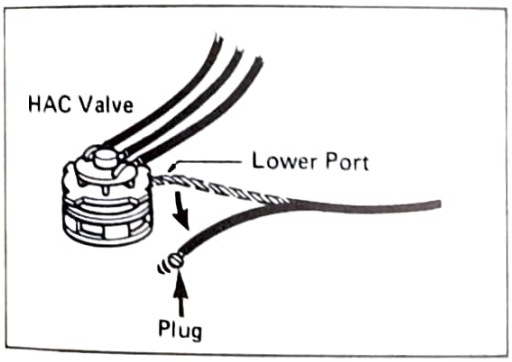


(d) Reconnect the hose to the sub-diaphragm.



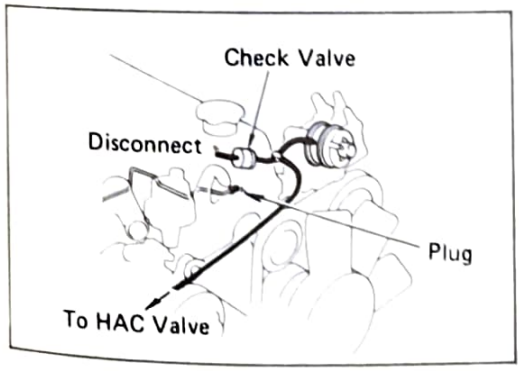
(e) Check that the ignition timing advances.

Ignition timing: About 15° BTDC



2. CHECK THE CHECK VALVE

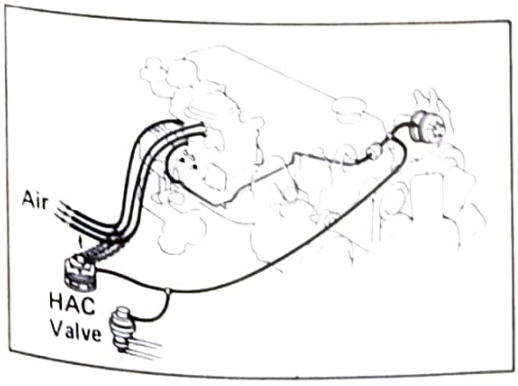
(a) Disconnect the vacuum hose from lower port of the HAC valve, and plug the hose end.



(b) Disconnect the vacuum hose between the check valve and vacuum pipe at the vacuum pipe side, and plug the vacuum pipe end.

(c) Check that the ignition timing remains stationary for more than one minute.

(d) Stop the engine and reconnect the hose to the vacuum pipe and HAC valve.



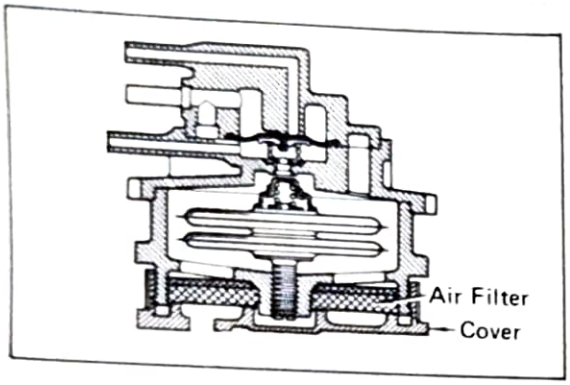
3. CHECK CARBURETOR

(a) Disconnect three hoses from the pipes on top of the HAC valve.

(b) Blow air into each hose and check that air flows into the carburetor.

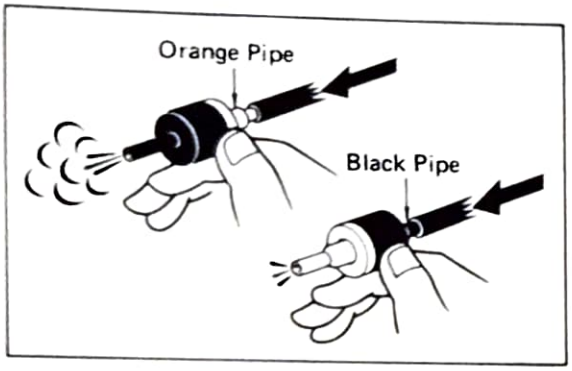
(c) Reconnect the hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF HAC VALVE

VISUALLY CHECK AND CLEAN AIR FILTER IN HAC VALVE

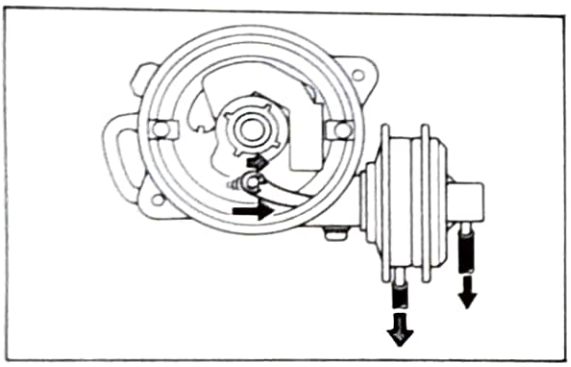


INSPECTION OF CHECK VALVE

CHECK VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow from the black pipe to the orange pipe.



INSPECTION OF DISTRIBUTOR VACUUM ADVANCER

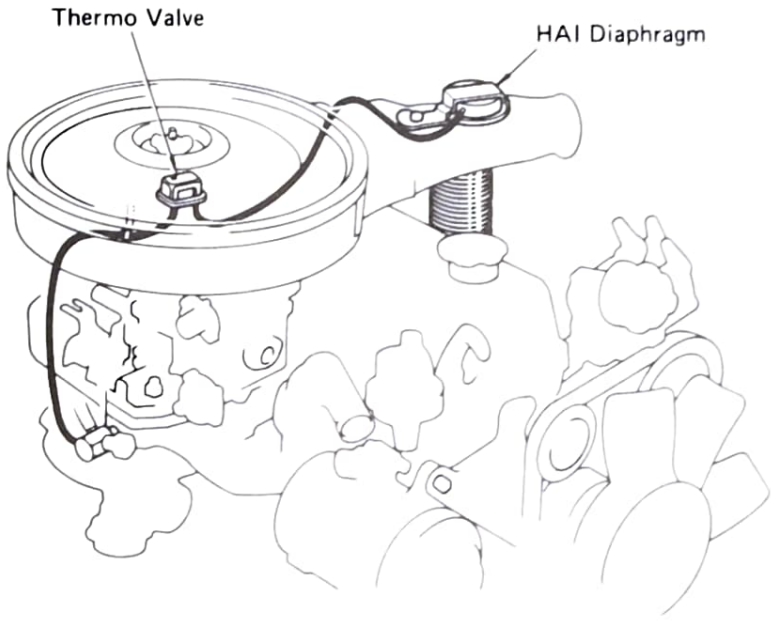
CHECK OPERATION OF VACUUM ADVANCER

(a) Remove the distributor cap and rotor.

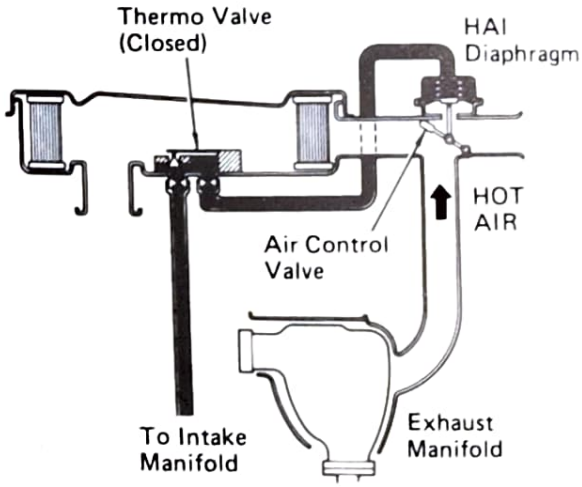
(b) Apply vacuum to the diaphragm, and check that the vacuum advancer moves in accordance with the vacuum.

(c) Reinstall the rotor and distributor cap.

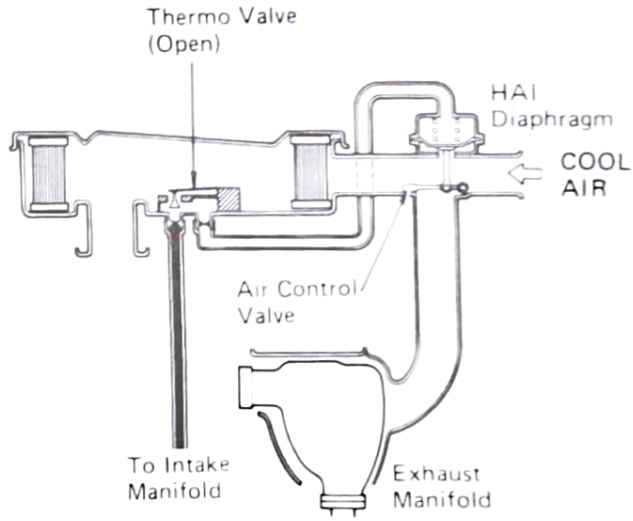
Auxiliary Systems
1. Automatic Hot Air Intake (HAI) System



COLD

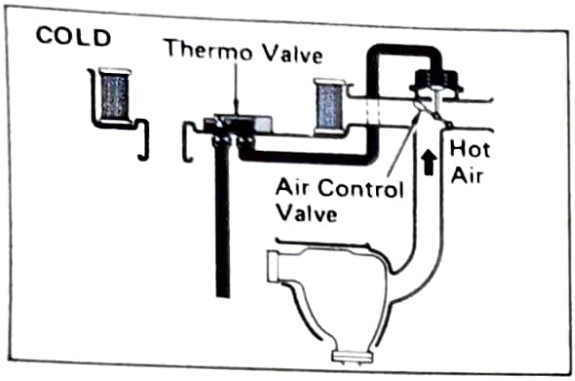


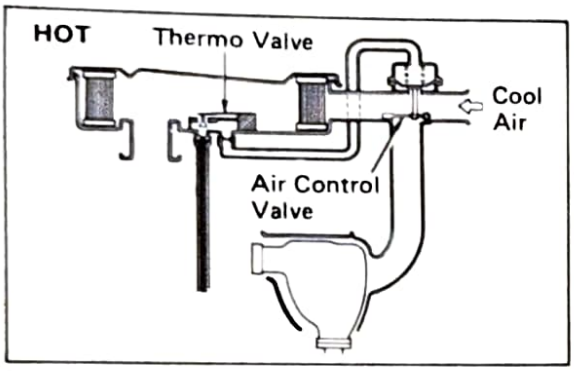
HOT



This system leads a hot air supply to the carburetor in cold weather to improve driveability and to prevent the carburetor from icing in extremely cold weather.

Temperature in Air Cleaner	Thermo Valve	Air Control Valve	Intake Air
Cool Below 30°C (86°F)	CLOSED	Hot air passage OPEN	HOT
Hot Above 45°C (113°F)	OPEN	Cool air passage OPEN	COOL





INSPECTION OF HAI SYSTEM

1. CHECK AIR CONTROL VALVE OPERATION

(a) Remove the air cleaner cover.

(b) Cool the thermo valve by blowing compressed air on it.

(c) Check that the air control valve closes the cool air passage at idle.

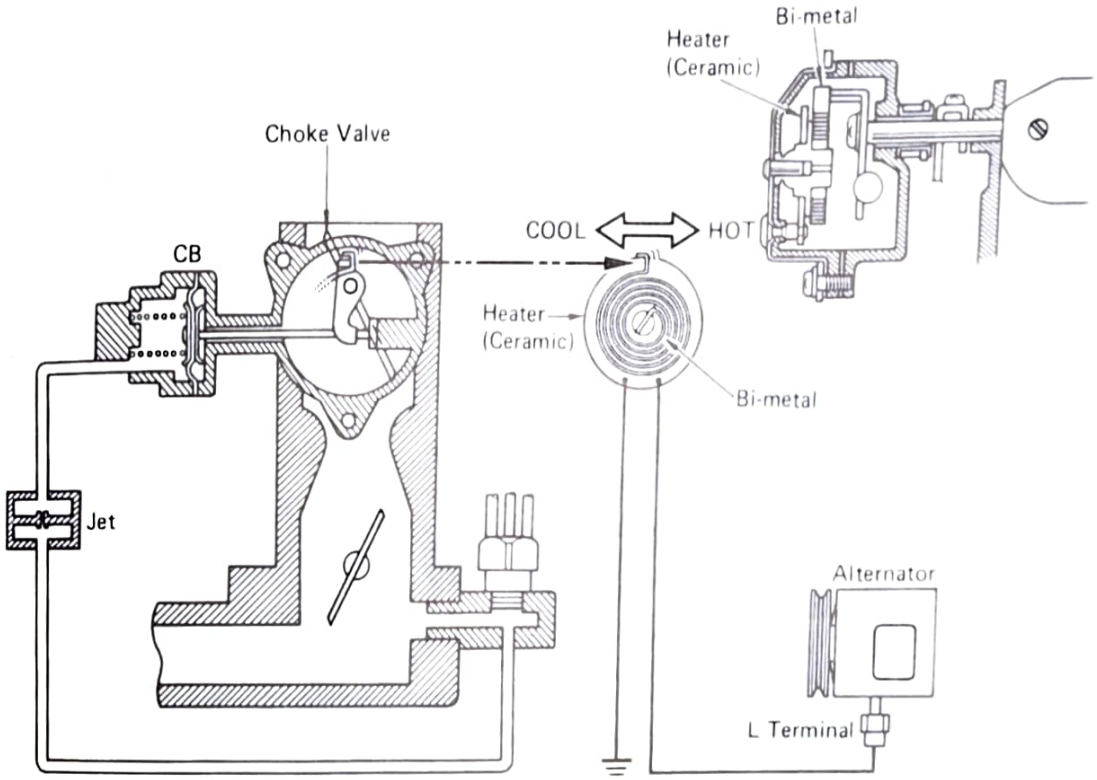
(d) Reinstall the air cleaner cover and warm up the engine.

(e) Check that the air control valve opens the cool air passage at idle.

2. CHECK HOSES AND CONNECTIONS

Visually check the hoses and connections for cracks, leaks or damage.

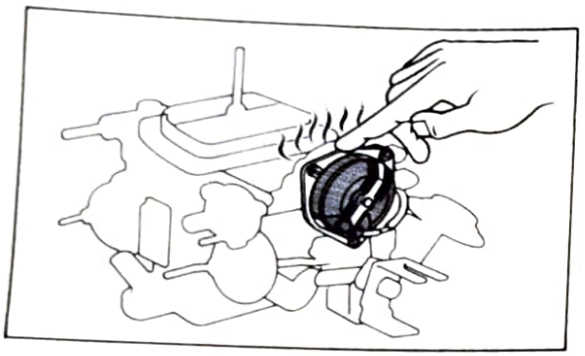
2. Automatic Choke System



This system temporarily supplies a rich mixture to the engine by closing the choke valve when the engine is cold.

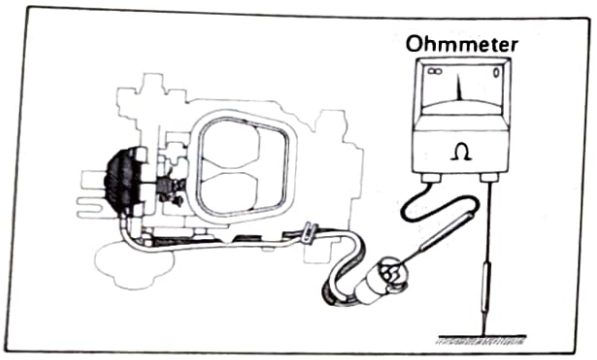
IG S/W	Engine	Current from L Terminal to Heater	Bi-metal	Choke Valve
OFF	Not running	Not flowing	Expanded	CLOSED
ON	Not running	*Not flowing	Expanded	CLOSED
	Running	Flowing	Heated up and contracted	OPEN

Remarks: *On alternators with an IC regulator, slight voltage will occur when the ignition which is turned ON, but not sufficient current to warm up the heater.



INSPECTION OF AUTOMATIC CHOKE SYSTEM

1. START ENGINE
2. SHORTLY AFTER, CHECK THAT CHOKE VALVE BEGINS TO OPEN AND CHOKE HOUSING IS HEATED

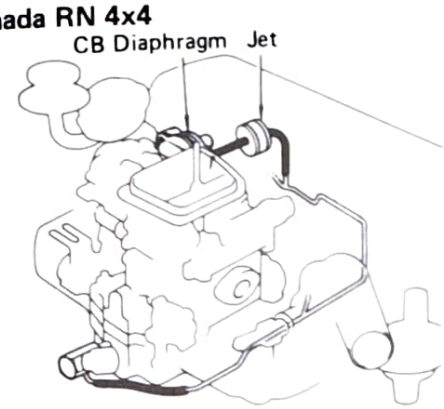


INSPECTION OF HEATER (Ceramic)

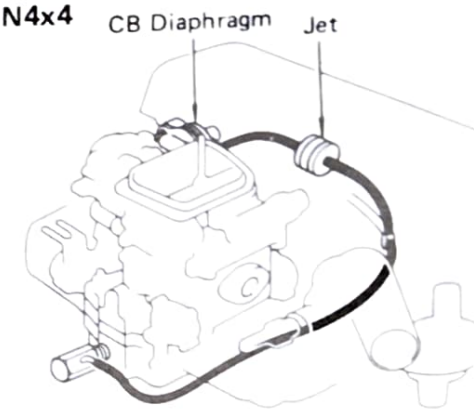
1. UNPLUG WIRING CONNECTOR
2. MEASURE RESISTANCE WITH OHMMETER
   Resistance: 16 – 20Ω at 20°C (68°F)

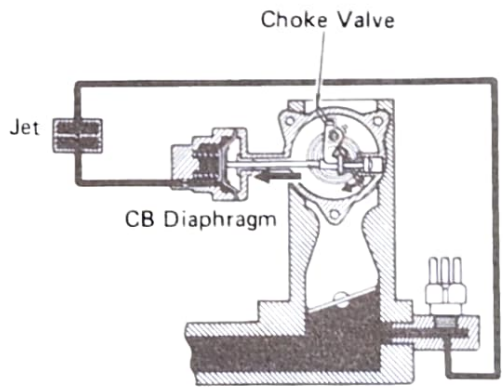
3. Choke Breaker (CB) System

Except Canada RN 4x4

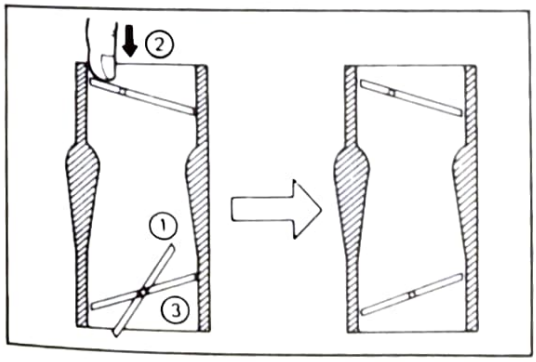


For Canada RN4x4





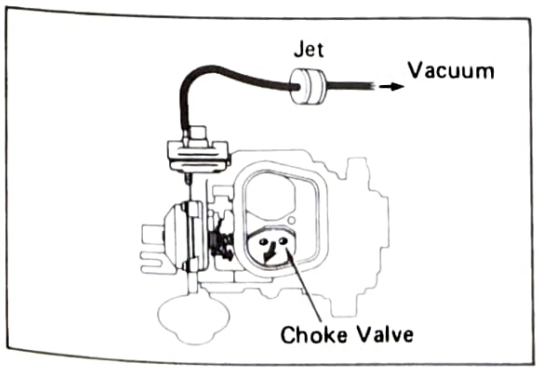
This system slightly opens the choke valve to prevent too rich mixture after firing when the choke is closed.



INSPECTION OF CB SYSTEM

CHECK CHOKE LINKAGE AND DIAPHRAGM WITH COLD ENGINE

(a) While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

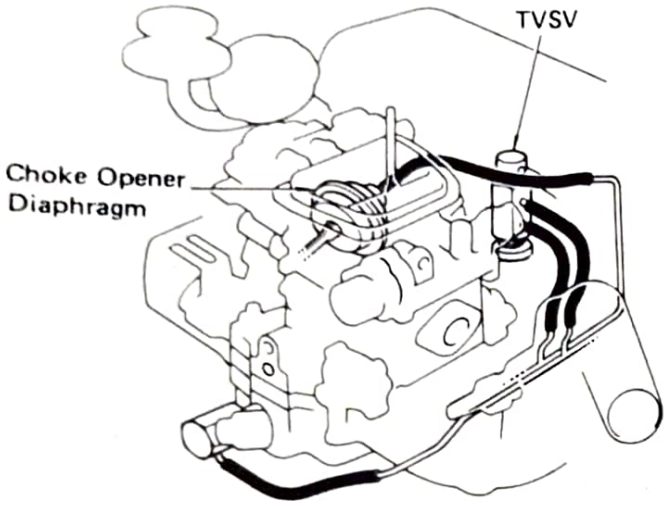


(b) Disconnect the vacuum hose between the jet and vacuum pipe at the jet side.

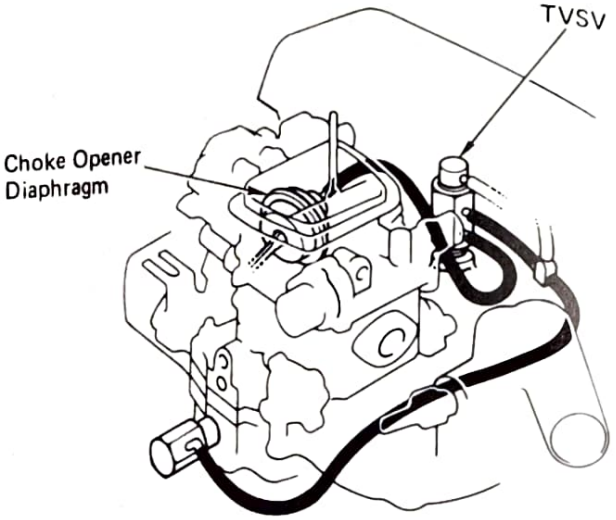
(c) Apply vacuum to the jet and check that the choke valve slightly opens.

4. Choke Opener System

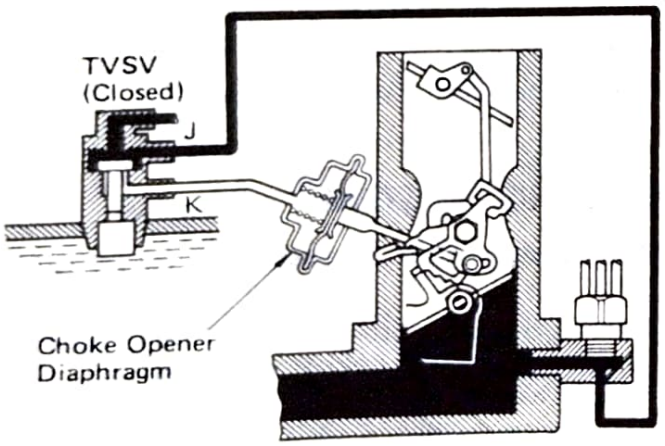
Except Canada RN 4x4



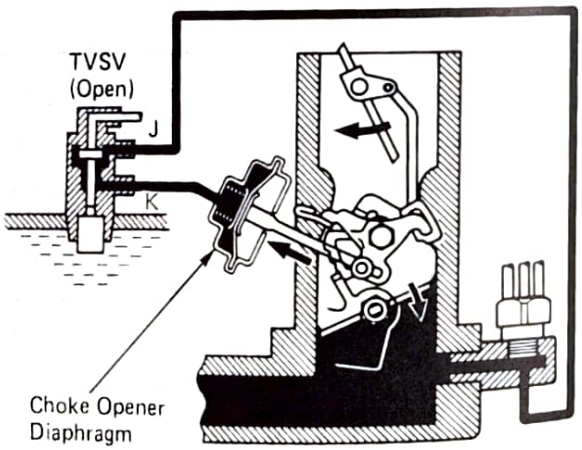
For Canada RN 4x4



COLD

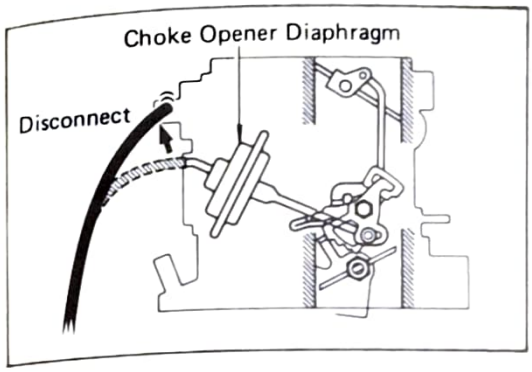


HOT



After warm-up, this system forcibly holds the choke valve open to prevent an over-rich mixture and release the fast idle cam to the 4th step to lower the engine rpm.

Coolant Temp.	TVSV	Diaphragm	Choke Valve	Fast Idle Cam	Engine RPM
Below 60°C (140°F)	CLOSED (J–K)	Released by spring tension	Closed by automatic choke	Set at 1st or 2nd step	HIGH
Above 75°C (167°F)	OPEN (J–K)	Pulled by manifold vacuum	OPEN	Released to 4th step	LOW



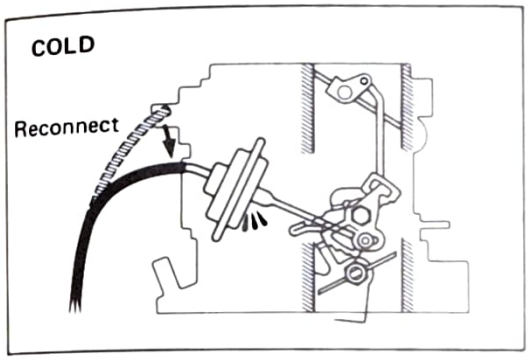
INSPECTION OF CHOKE OPENER SYSTEM

1. CHECK TVSV WITH COLD ENGINE

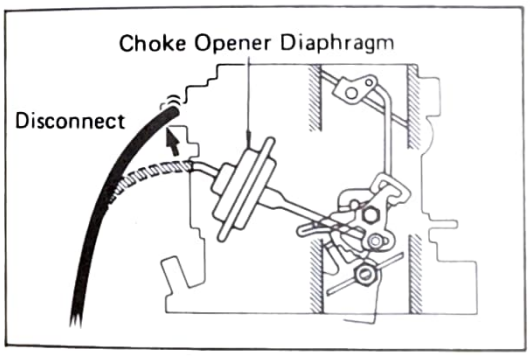
(a) The coolant temperature should be below 60°C (140°F).

(b) Disconnect the vacuum hose from the choke opener diaphragm.

(c) Step down on the accelerator pedal and release it. Then start the engine.



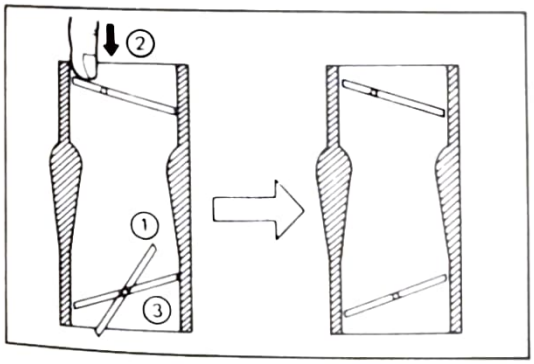
(d) Reconnect the vacuum hose and check that the choke linkage does not move.



2. CHECK TVSV, DIAPHRAGM AND LINKAGE WITH WARM ENGINE

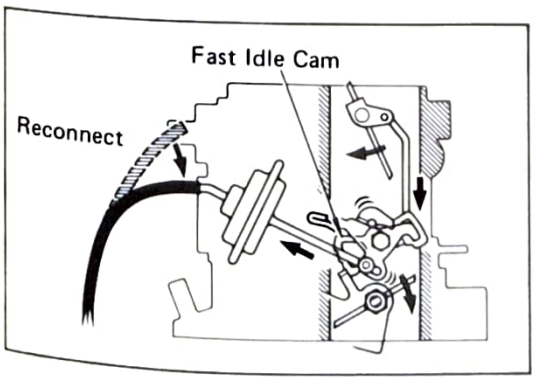
(a) Warm-up the engine to normal operating temperature.

(b) Disconnect the vacuum hose from the choke opener diaphragm.



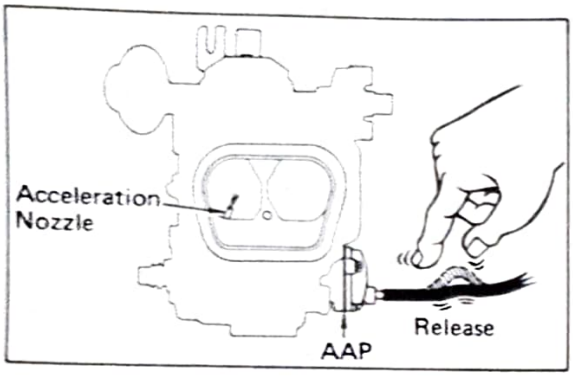
(c) Set the fast idle cam.
While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

(d) Start the engine, but do not touch the accelerator pedal.



(e) Reconnect the vacuum hose, and check that the choke linkage moves, and that fast idle cam is released to 4th step.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

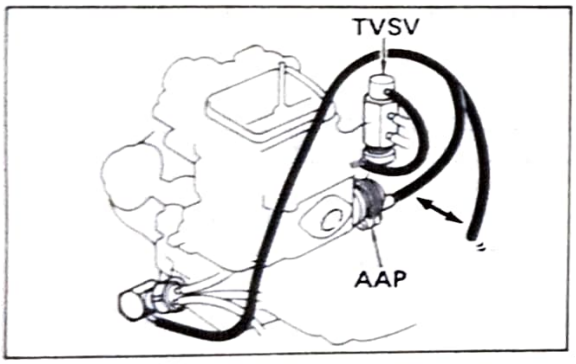


INSPECTION OF AAP SYSTEM

1. CHECK SYSTEM WITH COLD ENGINE
   (a) Check that the coolant temperature is below 60°C (140°F).
   (b) Remove the air cleaner.
   (c) Start the engine.
   (d) Pinch the AAP hose, and stop the engine.
   (e) Release the hose.
   (f) Check that gasoline spurts out from the acceleration nozzle.

2. REPEAT (c), (d) AND (e) ABOVE AFTER WARM-UP
   (a) Check that gasoline does not spurt out from the acceleration nozzle.
   (b) Reinstall the air cleaner.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF AAP DIAPHRAGM

CHECK DIAPHRAGM OPERATION AT IDLE

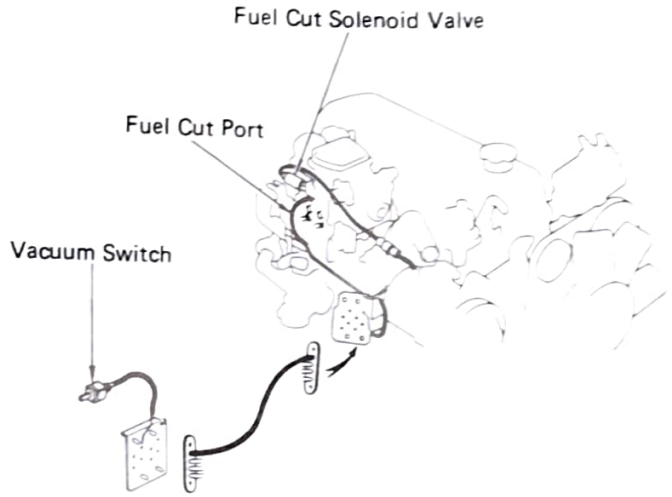
(a) Start the engine.
(b) Disconnect the vacuum hose from the AAP.
(c) Apply and release vacuum to the diaphragm at idle.
(d) Check that the engine rpm changes by releasing vacuum.
(e) Reconnect the AAP hose.

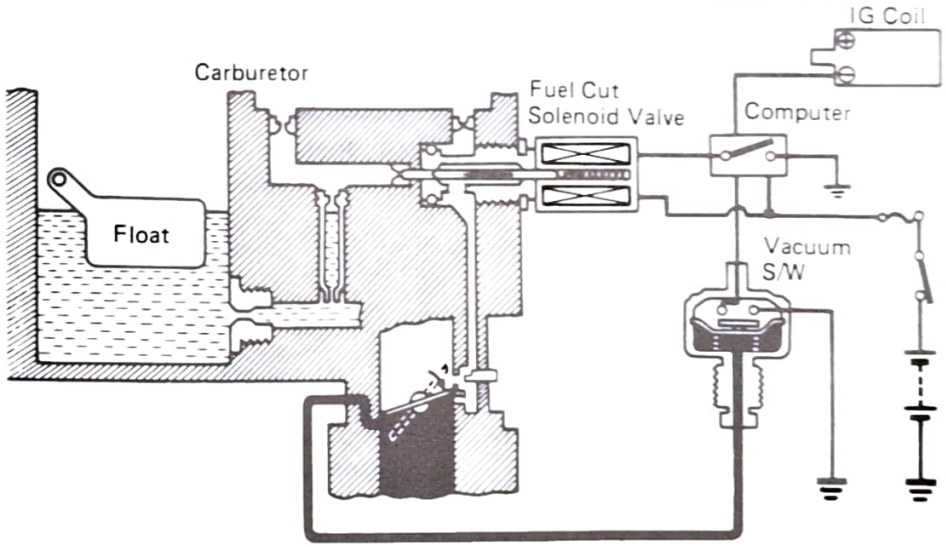
If a problem is found, replace the diaphragm.

INSPECTION OF TVSV

See page 3-96.

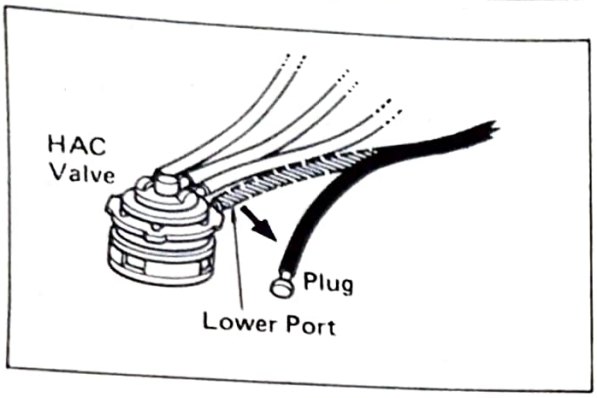
6. Deceleration Fuel Cut System (Except Canada RN 4×4)





This system cuts off part of the fuel in the slow circuit of the carburetor to prevent overheating and afterburning in the exhaust system.

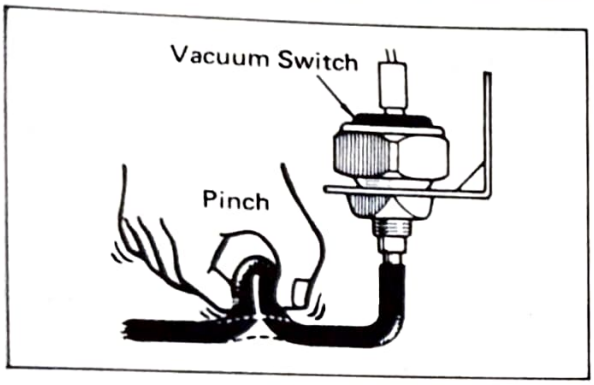
Engine RPM	Vacuum in the Vacuum S/W	Vacuum S/W	Computer	Fuel Cut Solenoid Valve	Slow Circuit in Carburetor
Below 2,200 rpm	Low vacuum below 360 mmHg (14.18 in.Hg)	ON	ON	ON	OPEN
	High vacuum above 425 mmHg (16.73 in.Hg)	OFF	ON	ON	OPEN
Above 2,590 rpm	Low vacuum below 360 mmHg (14.18 in.Hg)	ON	ON	ON	OPEN
	High vacuum above 425 mmHg (16.73 in.Hg)	OFF	OFF	OFF	CLOSED



INSPECTION OF DECELERATION FUEL CUT SYSTEM

1. PREPARATION

(For vehicles with HAC system)
Disconnect the vacuum hose from lower port of the HAC valve, and plug the hose end.



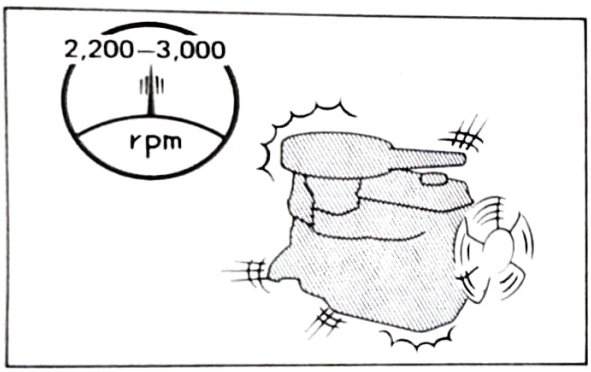
2. CHECK SYSTEM OPERATION

(a) Connect a tachometer to the engine.

(b) Start the engine.

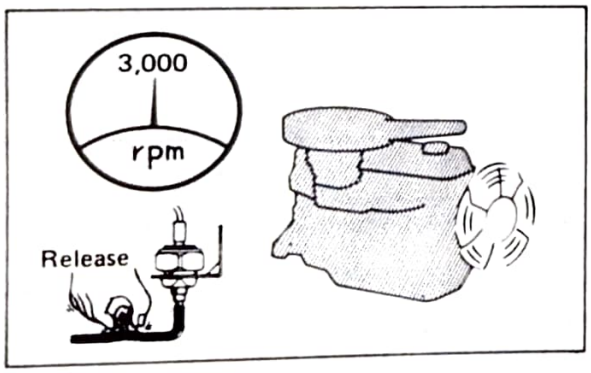
(c) Check that the engine runs normally.

(d) Pinch off the vacuum hose to the vacuum switch.

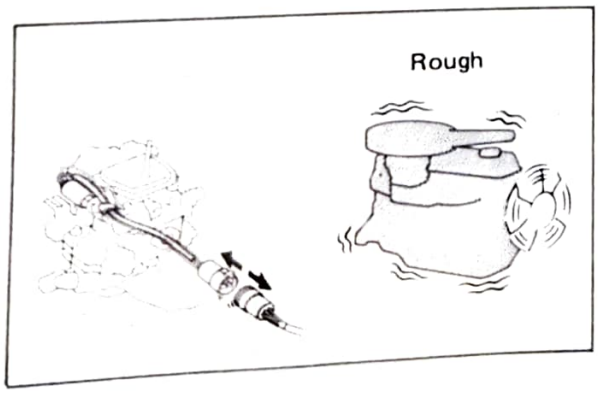


(e) Gradually increase engine speed to 3,000 rpm. Check that the engine misfires slightly between 2,200 and 3,000 rpm.

CAUTION: Perform this inspection quickly to avoid overheating the catalytic converter.



(f) Release the pinched hose. Again gradually increase the engine speed to 3,000 rpm and check that the engine operation returns to normal.

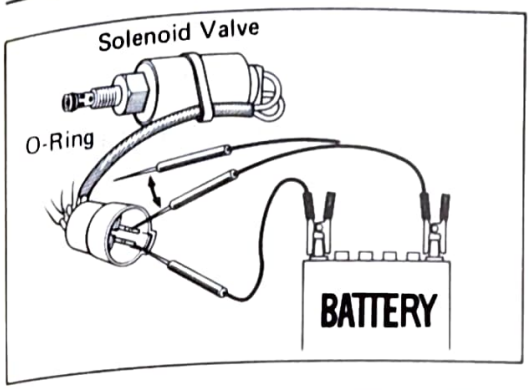


(g) With the engine idling, unplug the wiring connector to the solenoid valve. Check that the engine idles rough or dies.

CAUTION: Perform this inspection quickly to avoid otherheating the catalyst.

(h) Stop the engine, and reconnect the wiring. Remove the tachometer.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY, OTHERWISE INSPECT EACH PART



INSPECTION OF FUEL CUT SOLENOID VALVE

(a) Remove the solenoid valve.

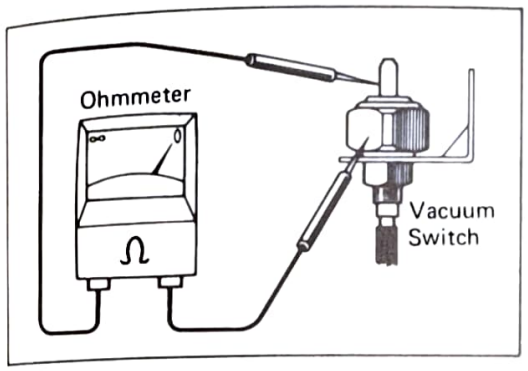
(b) Connect two terminals and the battery terminals as shown.

(c) Check that you can feel the "click" from the solenoid valve when the battery is connected and disconnected.

(d) Check the O-ring for damage.

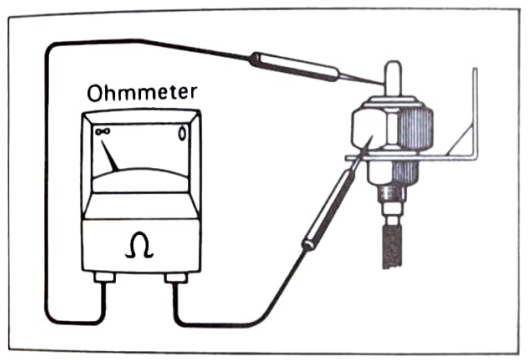
(e) Reinstall the valve and reconnect the wiring connector.

If a problem is found, replace the solenoid valve or O-ring.



INSPECTION OF VACUUM SWITCH

(a) Using an ohmmeter, check for continuity between the switch terminal and switch body.



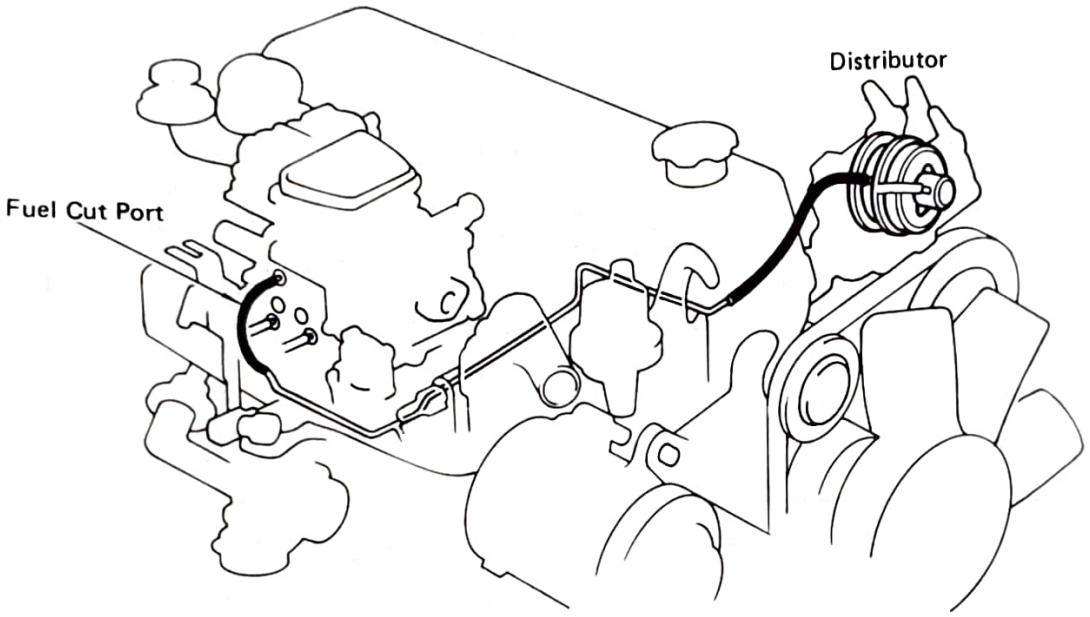
(b) Start the engine.

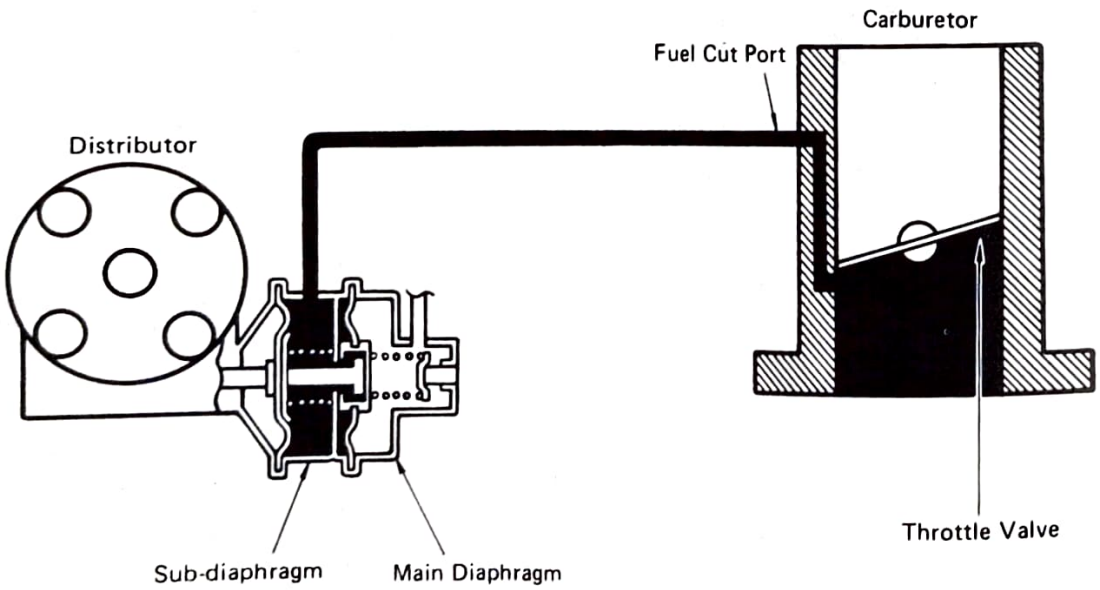
(c) Using an ohmmeter, check that there is no continuity between the switch terminal and the body.

If a problem is found, replace the vacuum switch.

7. Idle Advance System (Without HAC System Vehicle)

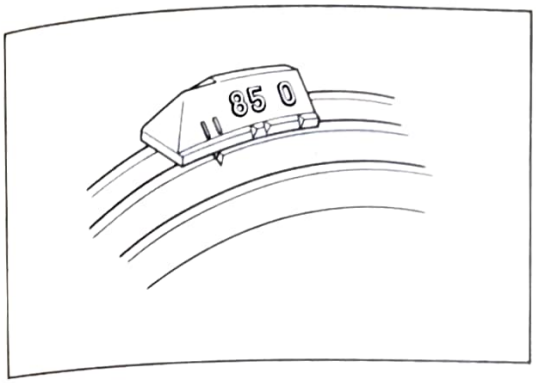
With HAC system vehicle: Refer to page 3-86 of HAC system.





To improve fuel economy at idle, this ignition system advances the ignition timing only while the engine is idling.

Condition	Distributor Sub-diaphragm	Sub-vacuum Advance
Idling	Pulled by fuel cut port vacuum	ADVANCED (+7°)
Cruising	Not pulled	NOT ADVANCED



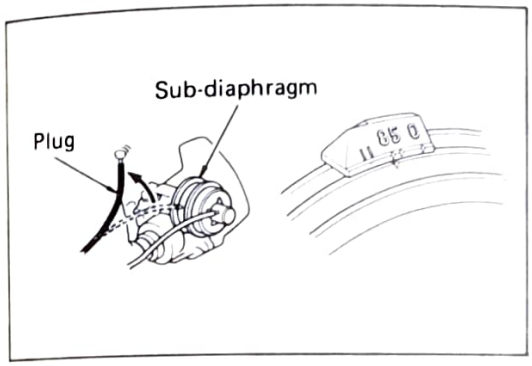
INSPECTION OF SYSTEM

CHECK SYSTEM OPERATION

(a) Warm up the engine to normal operating temperature.

(b) Check the ignition timing at idle.

Ignition timing: 15° BTDC



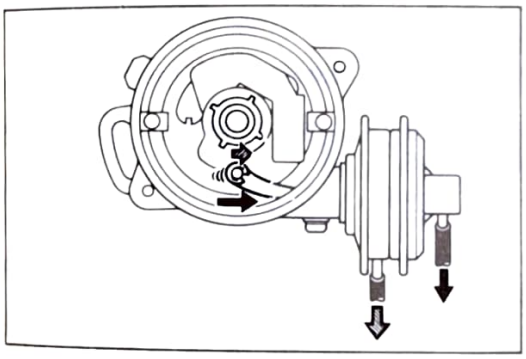
(c) Disconnect the vacuum hose from the distributor sub-diaphragm and plug the hose end.

(d) Check the ignition timing at idle.

Ignition timing: 8° BTDC

(e) Reconnect the vacuum hose and remove the timing light.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF DISTRIBUTOR VACUUM ADVANCER

CHECK OPERATION OF VACUUM ADVANCER BY APPLYING VACUUM

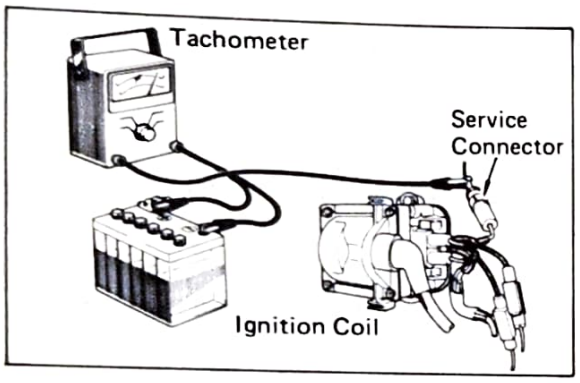
(a) Remove the distributor cap and rotor.

(b) Check that the vacuum advancer moves in accordance with the vacuum.

(c) Reinstall the rotor and distributor cap.

If a problem is found, repair or replace the distributor vacuum advancer.

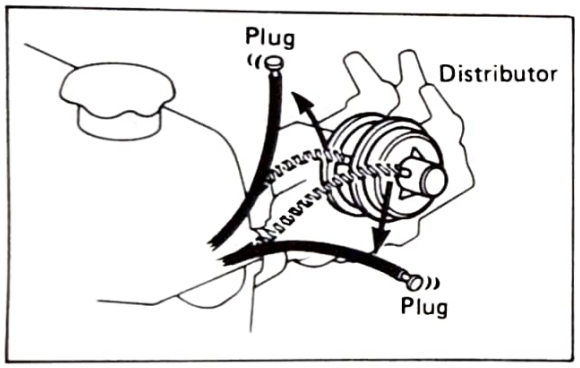
ENGINE ADJUSTMENT
Ignition Timing
INSPECTION AND ADJUSTMENT OF IGNITION TIMING



1. CONNECT A TACHOMETER AND TIMING LIGHT TO ENGINE

Remove the rubber cap and connect the tachometer (+) terminal to the service connector from the igniter.

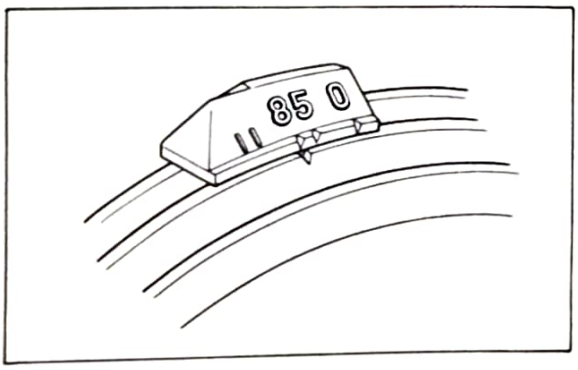
CAUTION:
1. **NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
2. As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.



2. WARM UP ENGINE

Allow the engine to reach full operating temperature.

3. DISCONNECT VACUUM HOSES FROM DISTRIBUTOR, AND PLUG HOSE ENDS

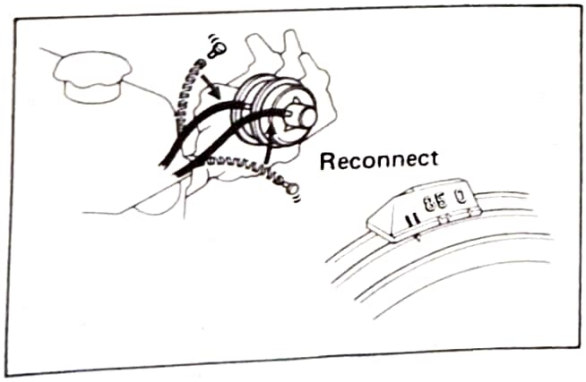


4. CHECK IGNITION TIMING

Ignition timing: 8° BTDC @ Max. 950 rpm

(a) With the engine idling as specified, use a timing light to check the timing.

(b) If necessary, loosen the distributor bolt and turn the distributor to align the marks. Recheck the timing after tightening the distributor.



5. FURTHER CHECK IGNITION TIMING AS FOLLOWS

(a) Reconnect the vacuum hoses to the distributor.

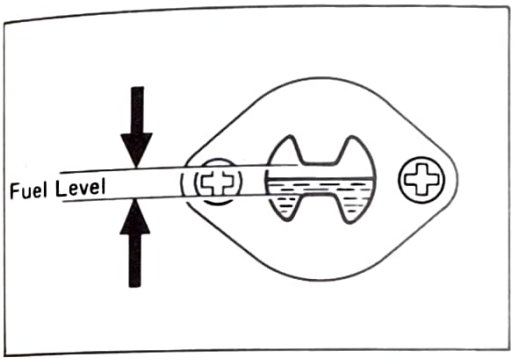
(b) Check that the ignition timing advances.

Ignition timing: About 15° BTDC

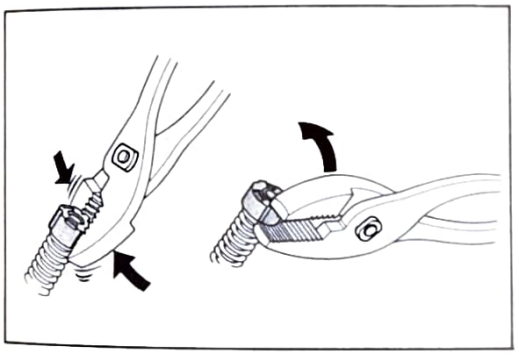
Idle Speed (Except Canada RN 4×4)

ADJUSTMENT OF IDLE SPEED

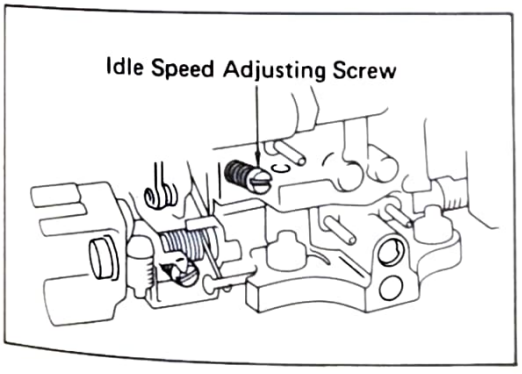
1. VISUALLY INSPECT CARBURETOR
   (a) Check for loose screws or loose mounting to the manifold.
   (b) Check for wear in the linkage, missing snap rings or excessive looseness in the throttle shaft. Correct any problems found.



2. INITIAL CONDITIONS
   (a) Air cleaner installed
   (b) Normal operating coolant temperature
   (c) Choke fully open
   (d) All accessories switched off
   (e) All vacuum lines connected
   (f) Ignition timing set correctly
   (g) Transmission in N range
   (h) Fuel level should be about even with the correct level in the sight glass.



3. BREAK IDLE LIMITER CAP ON IDLE SPEED ADJUSTING SCREW, IF INSTALLED



4. ADJUST IDLE SPEED

   Adjust the idle speed by turning the idle speed adjusting screw.

   Idle speed: 700 rpm M/T
   750 rpm A/T

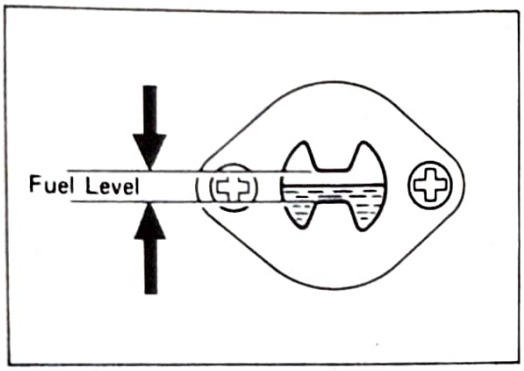
Idle Speed and Idle Mixture (Canada RN 4×4)

ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE

1. VISUALLY INSPECT CARBURETOR

(a) Check for loose screws or loose mounting to the manifold.

(b) Check for wear in the linkage, missing snap rings or excessive looseness in the throttle shaft. Correct any problems found.



2. INITIAL CONDITIONS

(a) Air cleaner installed

(b) Normal operating coolant temperature

(c) Choke fully open

(d) All accessories switched off

(e) All vacuum lines connected

(f) Ignition timing set correctly

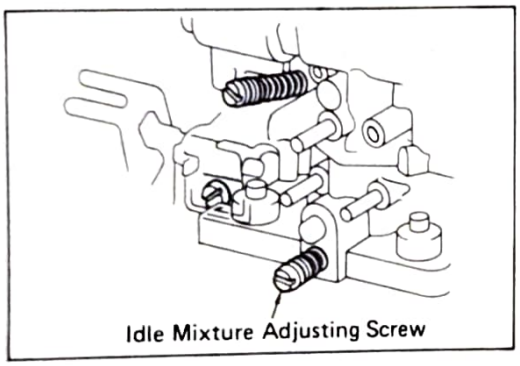
(g) Transmission in N range

(h) Fuel level should be about even with the correct level in the sight glass.

3. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Start the engine.

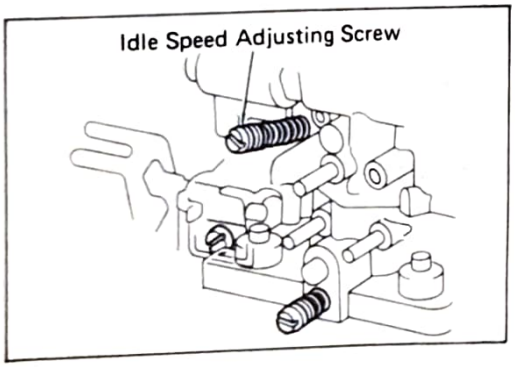
(b) Set to the maximum speed by turning the IDLE MIXTURE ADJUSTING SCREW.



(c) Set to the idle mixture speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle mixture speed: 740 rpm

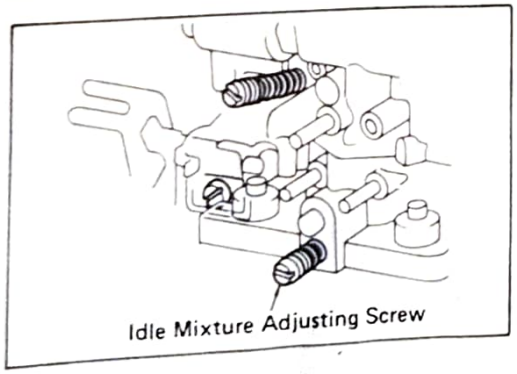
(d) Before moving to the next step, continue the adjustments (b) and (c) until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.

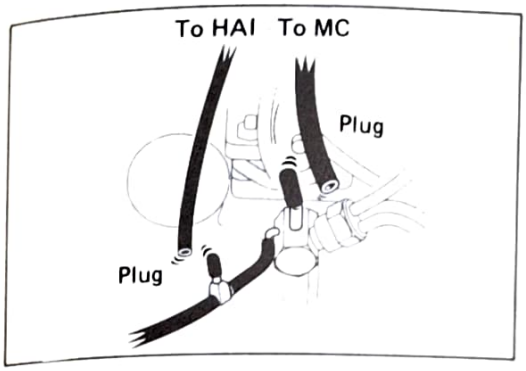


(e) Set to the idle speed by screwing in the IDLE MIXTURE ADJUSTING SCREW.

Idle speed: 700 rpm

This is the Lean Drop Method for setting idle speed and mixture.





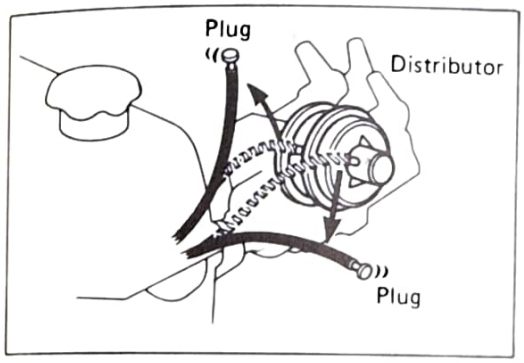
Fast Idle Speed

ADJUSTMENT OF FAST IDLE SPEED

1. REMOVE AIR CLEANER

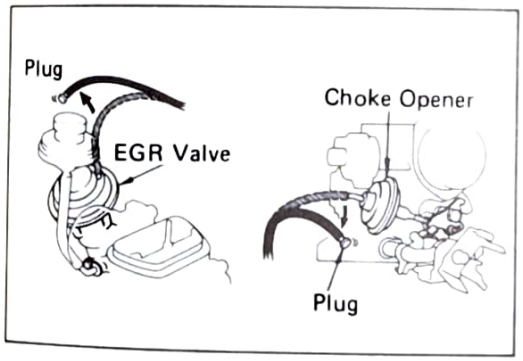
   Plug the hose connections for HAI system and MC system to prevent rough idling.

2. WARM UP AND STOP ENGINE



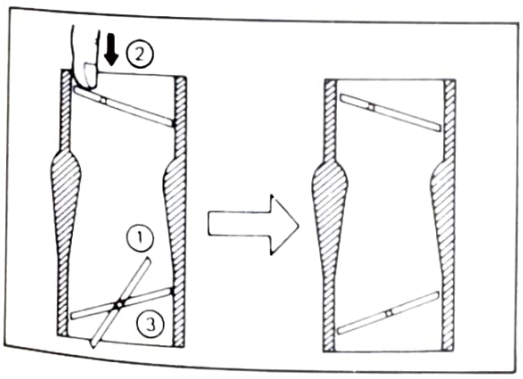
3. CUT OPERATION OF DISTRIBUTOR VACUUM ADVANCER

   Disconnect the vacuum hoses from the distributor vacuum advancer and plug the hose ends.



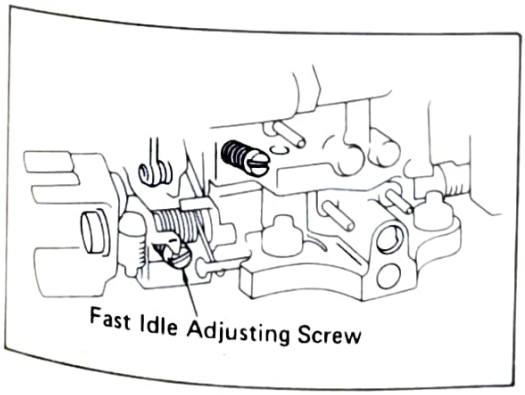
4. CUT OPERATION OF CHOKE OPENER AND EGR SYSTEM(S)

   Disconnect the vacuum hose(s) from the choke opener diaphragm and EGR valve, and plug the hose end(s).



5. SET FAST IDLE CAM

   While holding the throttle valve slightly open, push the choke valve closed and hold it closed as you release the throttle valve.



6. START ENGINE, BUT DO NOT TOUCH ACCELERATOR PEDAL

7. ADJUST FAST IDLE SPEED

   Adjust the fast idle speed by turning the fast idle adjusting screw.

   Fast idle speed: 2,600 rpm

8. RECONNECT VACUUM HOSES TO PROPER LOCATIONS

Idle HC/CO Concentration Check Method

NOTE: This check method is used only to determine whether or not the idle HC/CO complies with the state or city regulations.

PRECHECK

INITIAL CONDITIONS

(a) Normal engine operating temperature
(b) Choke fully open
(c) Air cleaner installed
(d) All accessories switched off
(e) All vacuum lines properly connected

NOTE: All vacuum hoses for air injection, EGR systems, etc. should be properly connected.

(f) Ignition timing set correctly
(g) Transmission in N range
(h) Carburetor fuel level about even with the correct level in the sight glass.
(i) Tachometer and HC/CO meter calibrated and at hand.

MEASUREMENT

1. INSERT TESTING PROBE OF HC/CO METER INTO TAILPIPE AT LEAST 60 cm (2ft)
2. MEASURE HC/CO CONCENTRATION AT IDLE

Wait at least one minute before measuring to allow the concentration to stabilize.

Complete the measuring within three minutes.

If the HC/CO concentration does not conform to regulations, see table below for possible causes.

TROUBLESHOOTING

HC	CO	Problems	Causes
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed ignition wires • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky exhaust valves 5. Leaky cylinder
High	Low	Rough idle Fluctuating HC reading	1. Vacuum leak: • Vacuum hose • Intake manifold • PCV line • Carburetor base
High	High	Rough idle Black smoke from exhaust	1. Restricted air filter 2. Plugged PCV valve 3. AI or AS system problem 4. Faulty carburetion: • Faulty choke action • Incorrect float setting • Leaking needle or seat • Leaking power valve

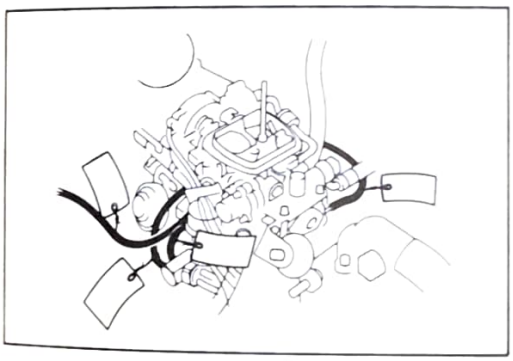
NOTE: If the HC/CO concentration cannot be corrected by above troubleshooting table, adjust the idle mixture.

Idle Mixture (Except Canada RN 4×4)

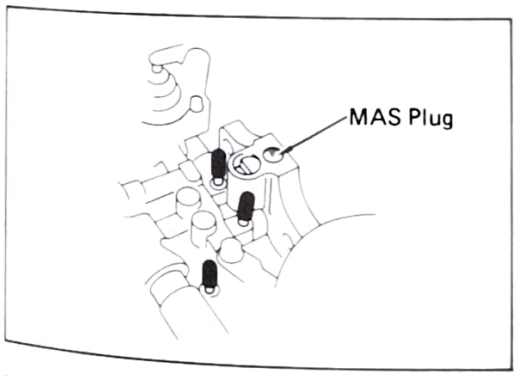
ADJUSTMENT OF IDLE MIXTURE

NOTE:

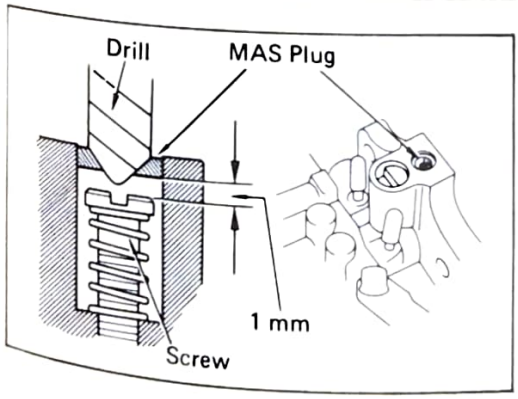
- To conform with Fed. and Calif. regulations, the idle mixture adjusting screw is adjusted and plugged with a steel plug by the manufacturer.
  Normally, this steel plug should not be removed.
- When troubleshooting rough idle, check all other possible causes before attempting to adjust the idle mixture (see TROUBLESHOOTING on page 3-2).
  Only if no other factors are found to be at fault, should the idle mixture be adjusted and, when doing so, remove the plug and follow the procedure described below.



1. REMOVE CARBURETOR
   (a) Before disconnecting the vacuum hoses, use tags to identify how they should be reconnected.
   (b) Remove the carburetor from the engine.
   (c) After removing the carburetor, cover the intake manifold with a clean rag.



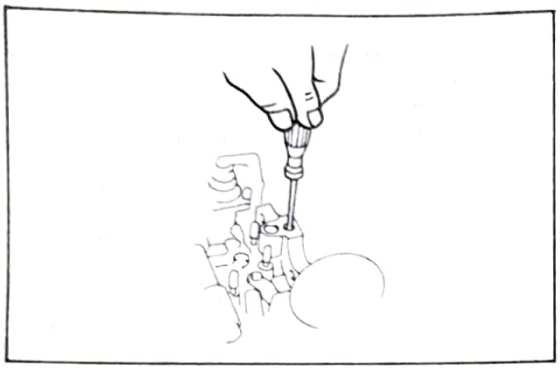
2. REMOVE MIXTURE ADJUSTING SCREW PLUG (MAS PLUG)
   (a) Plug each carburetor vacuum port to prevent entry of steel particles when drilling.
   (b) Mark the center of the plug with a punch.



   (c) Drill a 6.5 mmϕ (0.256 in.ϕ) hole in the center of the plug.

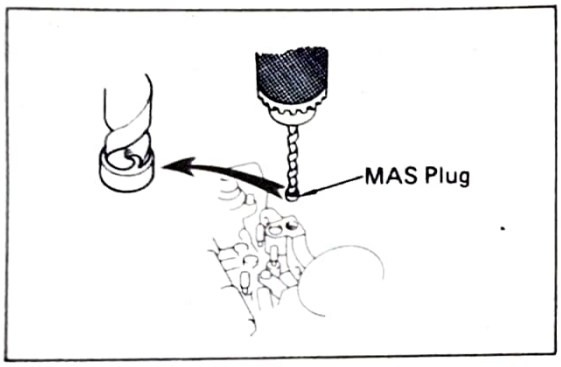
NOTE:

- As there is only 1 mm (0.04 in.) clearance between the plug and screw, drill carefully and slowly to avoid drilling onto the screw.
- The drill may force the plug off at this time.

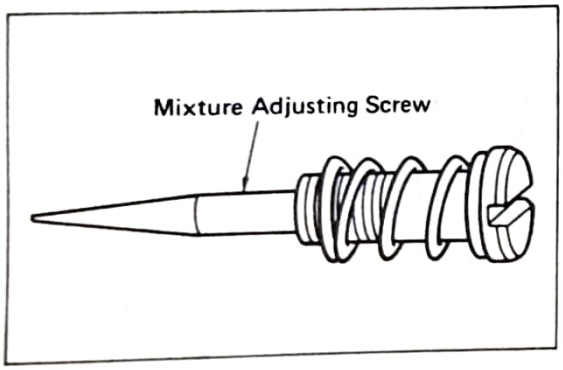


(d) Through the hole in the plug, fully screw in the mixture adjusting screw with a screwdriver.

NOTE: Be careful not to damage the screw tip by tightening the screw too tight.



(e) Use a 7.5 mmϕ (0.295 in.ϕ) drill to force the plug off.

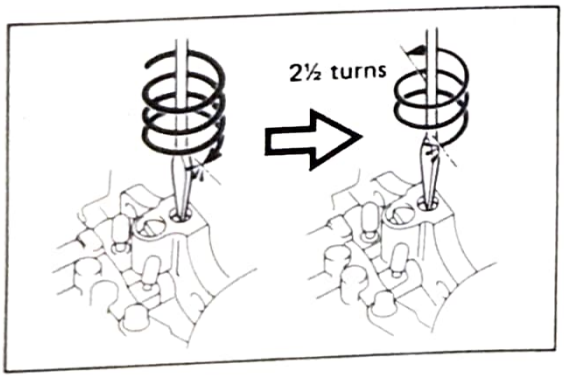


3. INSPECT MIXTURE ADJUSTING SCREW

(a) Blow off any steel particles with compressed air.

(b) Remove the screw and inspect it.

If the drill has gnawed into the screw top or if the tapered position is damaged, replace the screw.



4. REINSTALL MIXTURE ADJUSTING SCREW

Fully screw in the idle mixture adjusting screw and then unscrew it about 2½ turns.

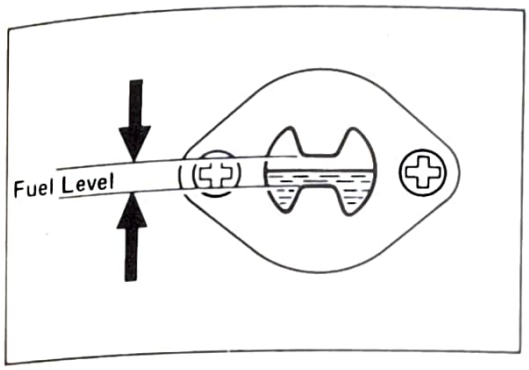
NOTE: Be careful not to damage the screw tip by tightening the screw too tight.

5. REINSTALL CARBURETOR

(a) Reinstall the carburetor on the engine.

(b) Reconnect the vacuum hoses to the proper locations. Refer to the Vacuum Hose Information label.

6. REINSTALL AIR CLEANER

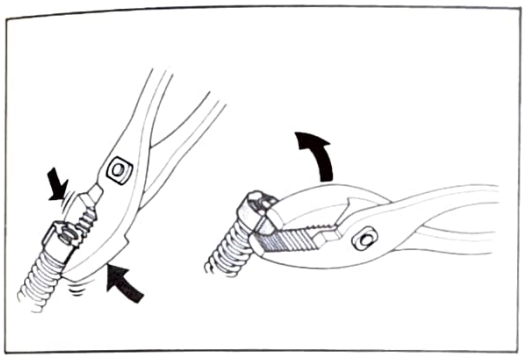


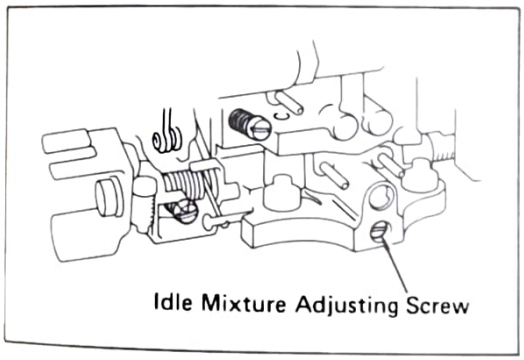
7. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Initial conditions:

- Air cleaner installed
- Normal operating coolant temperature
- Choke fully open
- All accessories switched off
- All vacuum lines connected
- Ignition timing set correctly
- Transmission in N range
- Fuel level should be about even with the correct level in the sight glass.

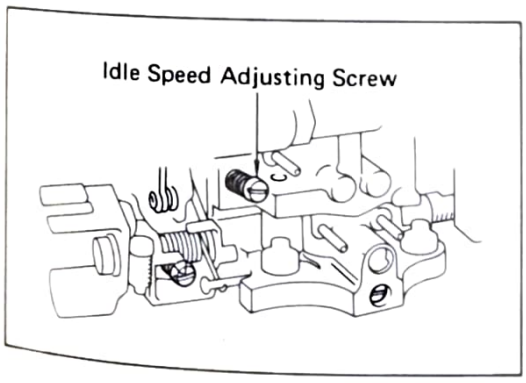
(b) Break the idle limiter cap on the idle speed adjusting screw if installed.





(c) Start the engine.

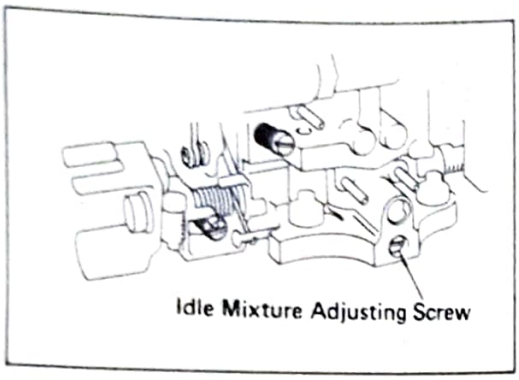
(d) Set to the maximum speed by turning the IDLE MIXTURE ADJUSTING SCREW.



(e) Set to the idle mixture speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle mixture speed:
740 rpm M/T
790 rpm A/T

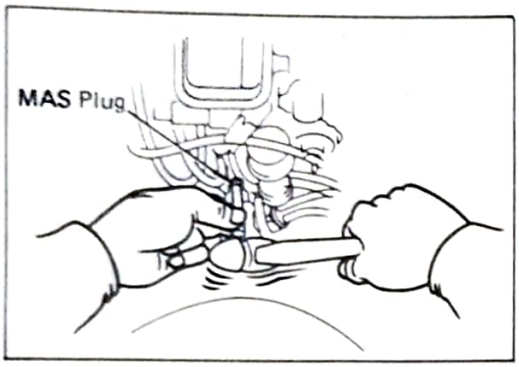
(f) Before moving to the next step, continue adjustments (d) and (e) until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.



(g) Set to the idle speed by screwing in the IDLE MIXTURE ADJUSTING SCREW.

Idle speed:
700 rpm M/T
750 rpm A/T

This is the Lean Drop Method for setting idle speed and mixture.



8. PLUG IDLE MIXTURE ADJUSTING SCREW

(a) Remove the air cleaner.

(b) Tap in new plug until it is even with carburetor surface.

(c) Reinstall the air cleaner.

MAJOR ENGINE

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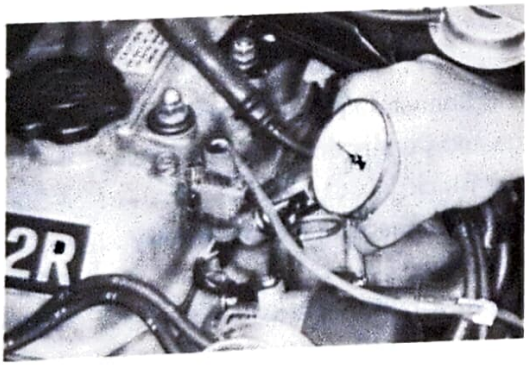
SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Valve guide replacer	09201-60011	To replace valve guide
Valve spring compressor	Commercial	To replace valve
Crankshaft pulley puller	09213-31021 or Commercial	To remove crankshaft pulley
Timing gear puller	09213-36010 or Commercial	To remove pump drive and sprocket
Connecting rod aligner	Commercial	To check rod alignment
Connecting rod bushing replacer	09222-30010 or Commercial	To replace rod bushings
Pilot bearing puller	09303-35010	To remove pilot bearing
Pilot bearing replacer	09304-30012 or Commercial	To install pilot bearing
Crankshaft rear oil seal replacer	09608-35013 or Commercial	To install rear oil seal
Crankshaft front oil seal replacer	09223-50010 or Commercial	To install front oil seal



COMPRESSION CHECK

1. REMOVE FOUR SPARK PLUGS
2. DISCONNECT HIGH TENSION WIRE FROM IGNITION COIL
3. MEASURE CYLINDER COMPRESSION PRESSURE
   (a) Insert a compression gauge into the spark plug hole.
   (b) Fully open the throttle.
   (c) While cranking the engine with the starter motor, measure the compression pressure.

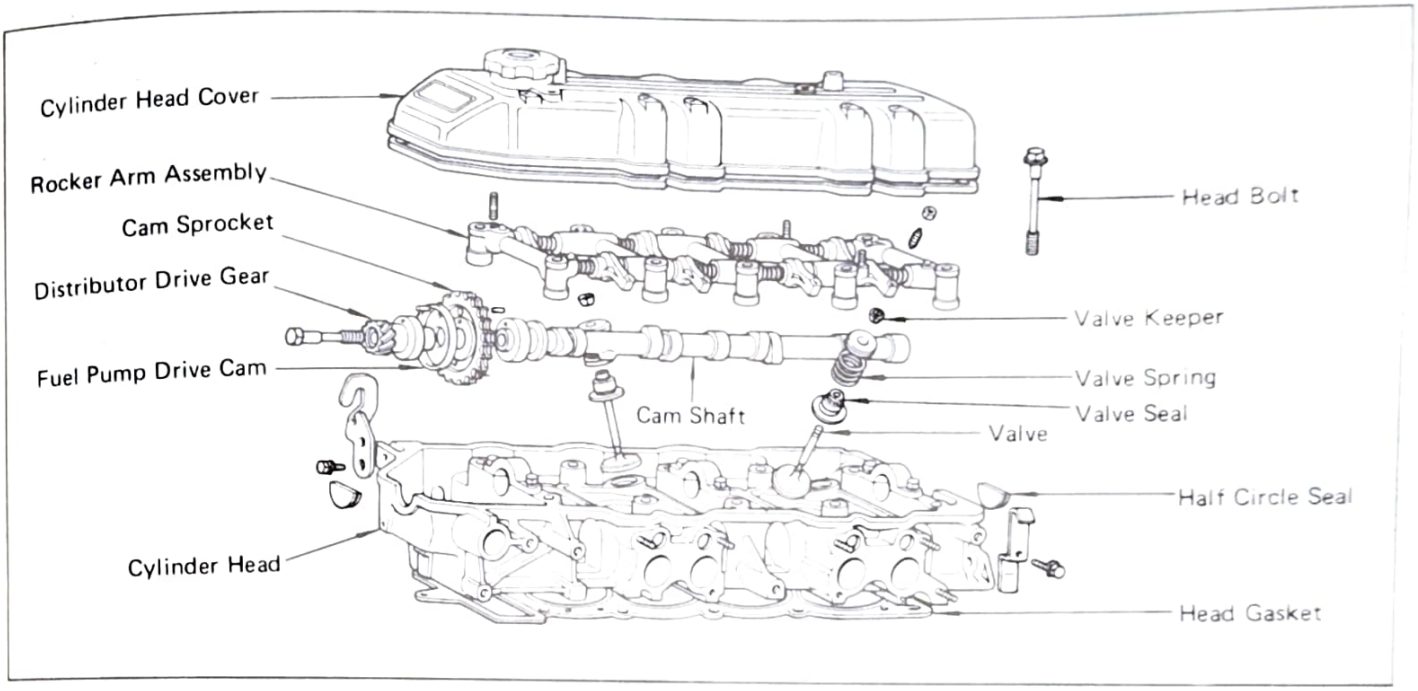
CAUTION: This test must be done for as short a time as possible to avoid overheating of the catalytic converter.

NOTE: Always use a fully charged battery to obtain engine revolution of more than 250 rpm.

(d) Repeat steps (a) through (c) for each cylinder.

Compression pressure: 12 kg/cm² (171 psi)
Minimum pressure: 10 kg/cm² (142 psi)
Difference between each cylinder: Less than 1.0 kg/cm² (14 psi)

CYLINDER HEAD

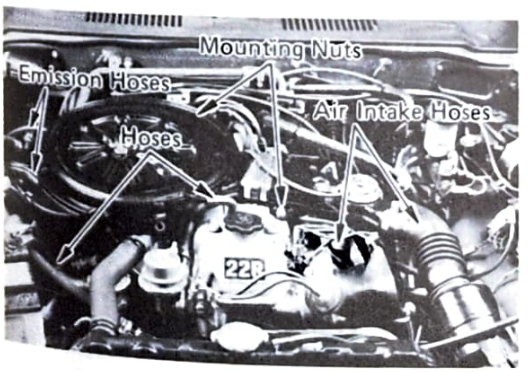


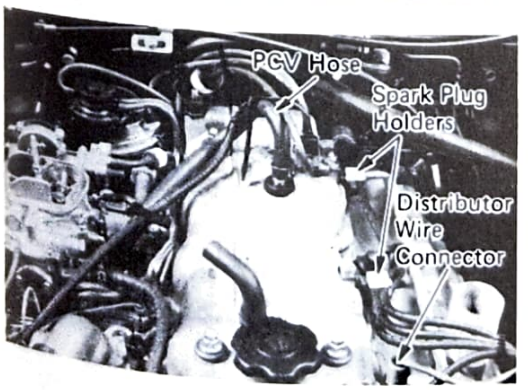
NOTE: If removing the cylinder head, perform these steps before beginning:

(a) Disconnect the cable from the negative terminal of the battery.

(b) Drain coolant from the radiator and engine block into a clean container.

(c) Drain engine oil as it may become contaminated with coolant.





REMOVAL OF CYLINDER HEAD COVER

1. REMOVE AIR CLEANER

(a) Disconnet the emission control hoses.

(b) Disconnect the air intake hose.

(c) Remove the two mounting nuts and butterfly nut.

(d) Lift up the air cleaner from the carburetor.

(e) Cover the carburetor with a clean cloth.

2. REMOVE FOLLOWING PARTS FROM CYLINDER HEAD COVER

(a) PCV hose

(b) Two spark plug wire holders

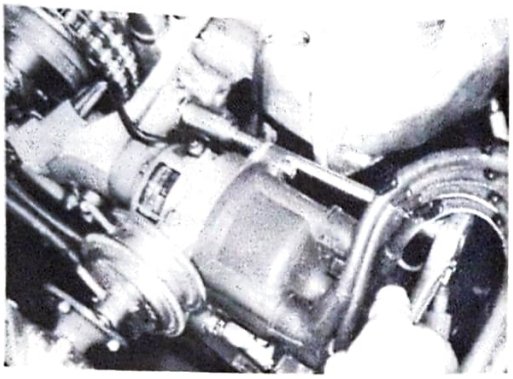
(c) Distributor wire connector

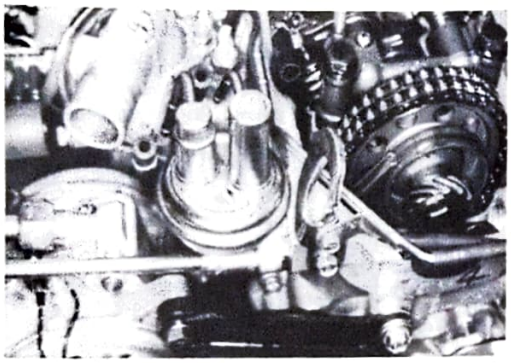
(d) Throttle cable for A/T

3. REMOVE CYLINDER HEAD COVER

Remove four nuts and seals and lift off the cylinder head cover.

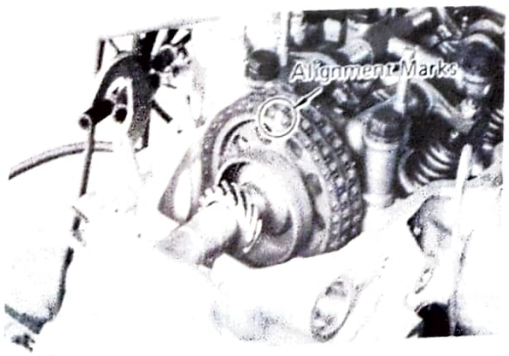
CAUTION: Cover the oil return hole in the head with a rag to prevent objects falling in.



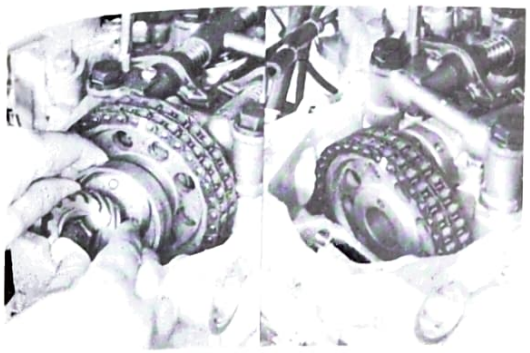


REMOVAL OF CYLINDER HEAD

1. DISCONNECT RADIATOR UPPER HOSE
2. REMOVE DISTRIBUTOR
   (a) Disconnect the spark plug wires by pulling the plug boot.
   (b) Disconnect the primary ignition wire from the distributor cap.
   (c) Disconnect the connector.
   (d) Remove the distributor hold-down bolt.
   (e) Remove the distributor from the cylinder head with the cap and wires attached.
3. REMOVE FUEL PUMP
   (See steps 2 through 4, page 5-3)
4. DISCONNECT FOLLOWING WIRES:
   (a) Bond cables from the front and rear of the cylinder head
   (b) Carburetor wires
   (c) Thermo switch wires
5. DISCONNECT FOLLOWING HOSES:
   (a) Water by-pass hose from the intake manifold
   (b) Heater inlet hose from the water valve.
   (c) Brake booster hose from the intake manifold
   (d) Two fuel hoses from the pipes under the intake manifold
   (e) Hose from the air injection tube (Calif. RN and RN C&C)
   (f) Label and disconnect emission control hoses from the carburetor and intake manifold that will allow removal of the head.
6. DISCONNECT ACCELERATOR LINKAGE FROM CARBURETOR
7. DISCONNECT THROTTLE CABLE FROM CARBURETOR (A/T Vehicles)
8. REMOVE AIR SUCTION REAR PIPE (Fed. RN and Canada RN 4x2)



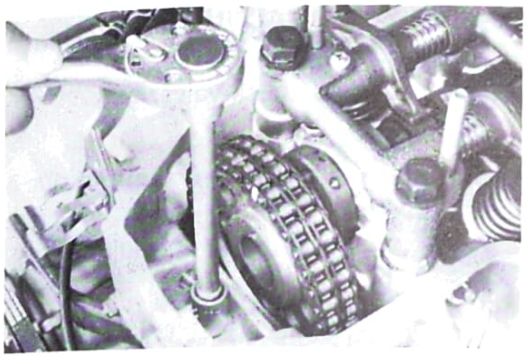
9. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD
10. REMOVE CAM SPROCKET BOLT
    (a) Turn the crankshaft until No. 1 piston is set at T.D.C. compression position.
    (b) Paint alignment marks on the sprocket and chain.
    (c) Remove the half circle seal.
    (d) Remove the cam sprocket bolt.



11. REMOVE DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM

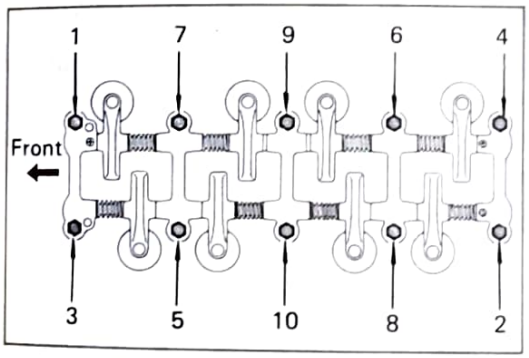
(a) Remove the distributor drive gear and fuel pump drive cam from the cam sprocket.

(b) Remove the cam sprocket and chain from the cam and leave in the position shown.



12. REMOVE CHAIN COVER BOLT

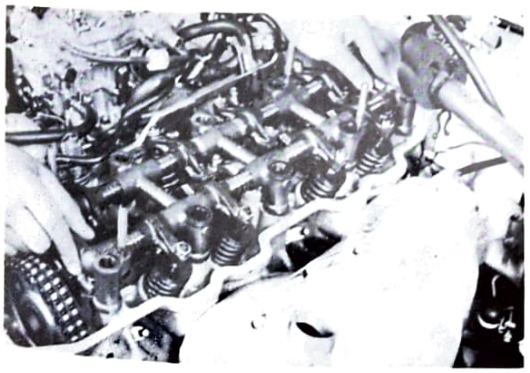
Remove one bolt in front of the head before the head bolts are removed.



13. REMOVE CYLINDER HEAD BOLTS

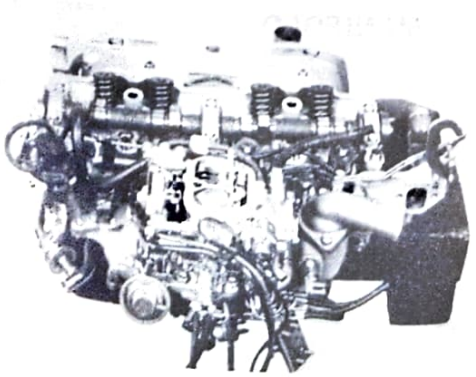
Remove ten head bolts in the numerical order shown.

CAUTION: **Head warpage or cracking could result from removing in incorrect order.**



14. REMOVE ROCKER ARM ASSEMBLY

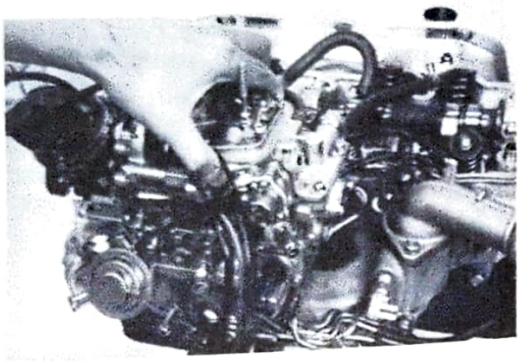
It may be necessary to use a pry bar on the front and rear of the rocker arm assembly to separate it from the head.

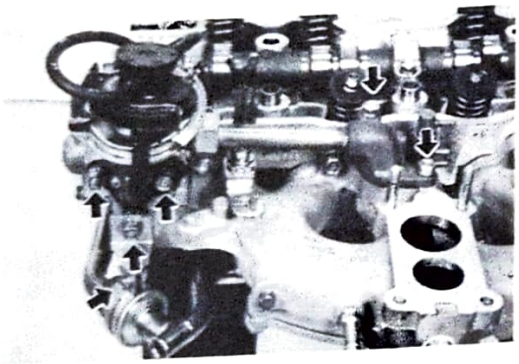


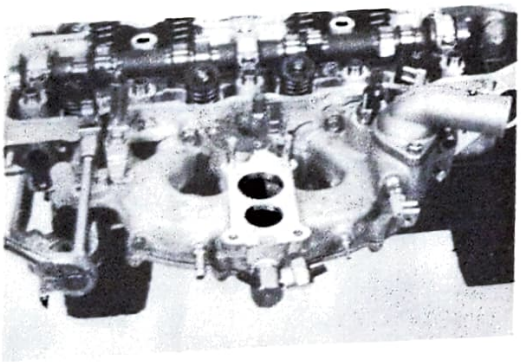
15. REMOVE CYLINDER HEAD

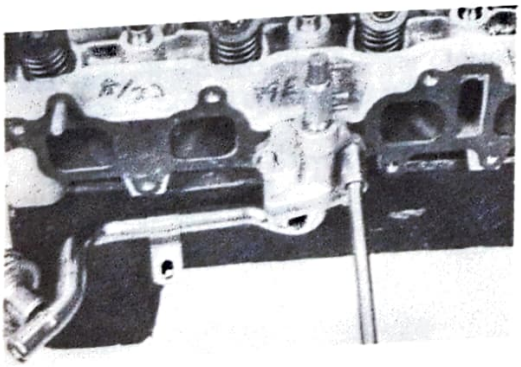
Lift the cylinder head from the dowels on the cylinder block and place the head on wood blocks on the bench.

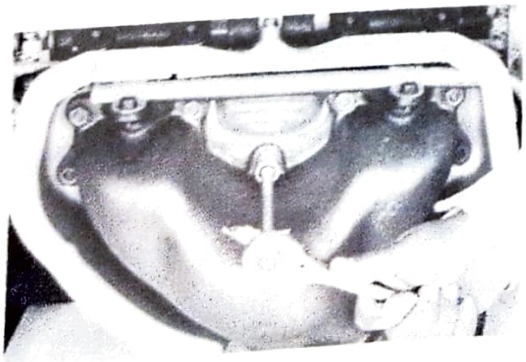
CAUTION: **Do not pry between cylinder head gasket and block deck.**











DISASSEMBLY OF CYLINDER HEAD
(See illustration on page 4-3)

1. REMOVE CARBURETOR
   (a) Disconnect the vacuum hoses from the carburetor.
   (b) Remove the carburetor from the intake manifold.

2. DISCONNECT VACUUM HOSES AND REMOVE VACUUM PIPE

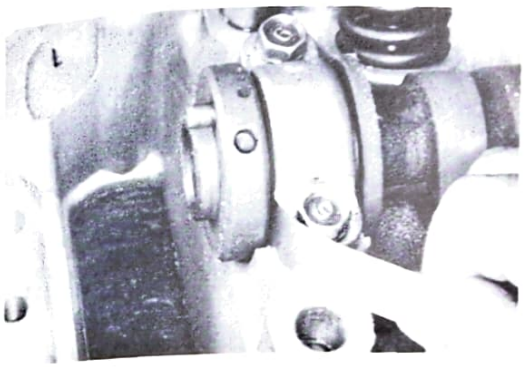
3. REMOVE EGR VALVE WITH VACUUM MODULATOR
   (a) Loosen the clamp on the AI check valve.
   (b) Remove the nut and two bolts.
   (c) Remove the two bolts on the intake manifold side of the EGR pipe.
   (d) Remove the EGR valve with vacuum modulator.

4. REMOVE INTAKE MANIFOLD
   (a) Remove six bolts and two nuts holding the manifold and remove the intake manifold.
   (b) Cover the intake manifold ports with clean cloths.

5. REMOVE THERMOSTATIC VALVE
   Remove two bolts and remove the valve and manifold gasket.

6. REMOVE EXHAUST MANIFOLD
   (a) Remove the outer insulator and gasket.
   (b) Remove the manifold with the air injection tube or air suction tube.
   (c) Remove the inner heat insulator.

7. REMOVE SPARK PLUGS

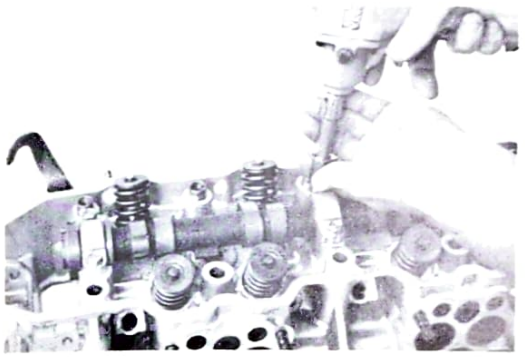


8. MEASURE CAMSHAFT THRUST CLEARANCE

Using a feeler gauge, measure the camshaft thrust clearance between the thrust bearing and cylinder head.

If clearance is greater than the maximum, replace the head.

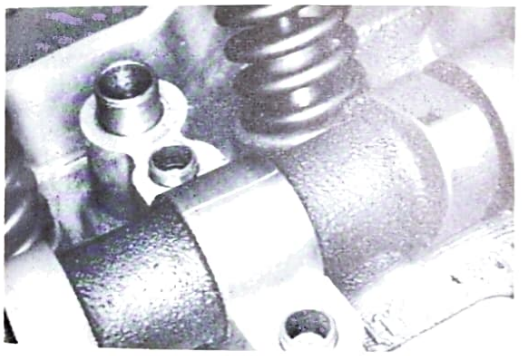
Maximum clearance: 0.25 mm (0.0098 in.)
Standard clearance: 0.08 – 0.18 mm (0.0031 – 0.0071 in.)



9. MEASURE JOURNAL OIL CLEARANCE

(a) Remove three cam bearing caps.

(b) Clean the bearing caps, camshaft and camshaft journals.



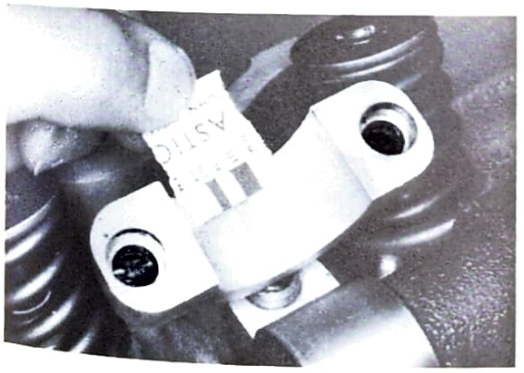
(c) Lay a strip of plastigage across each journal.

NOTE: Do not turn the camshaft while plastigage is in place.

(d) Install the correct numbered bearing cap on each journal with the arrows pointing to the front.

Torque each bolt.

Torque: 1.7 – 2.3 kg-m (13 – 16 ft-lb)

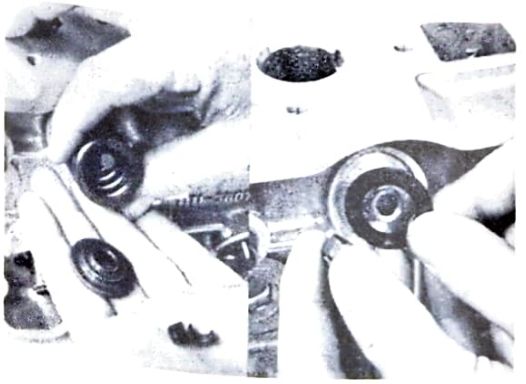


(e) Remove the caps. Measure the plastigage at its widest point.

If the clearance is greater than the maximum, replace the head and/or camshaft.

Maximum clearance: 0.1 mm (0.004 in.)
Standard clearance: 0.01 – 0.05 mm (0.0004 – 0.0020 in.)

10. LIFT OUT CAMSHAFT



11. REMOVE VALVES

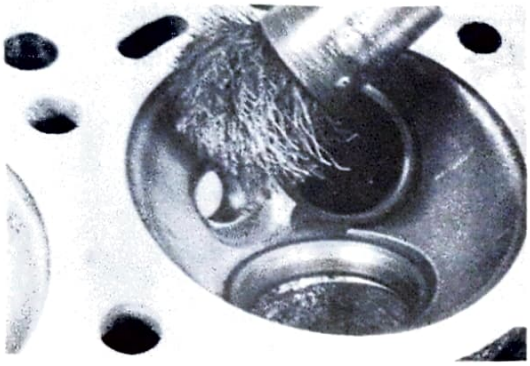
(a) Using a valve spring compressor, compress the valve retainer until two keepers can be removed.

(b) Remove the valve keepers, retainers, springs and valves.

NOTE: Keep valves in order so the valves can be installed in the same order as removed.

(c) Remove the valve seals.

(d) Using a small screwdriver or magnet, remove the valve spring seats.

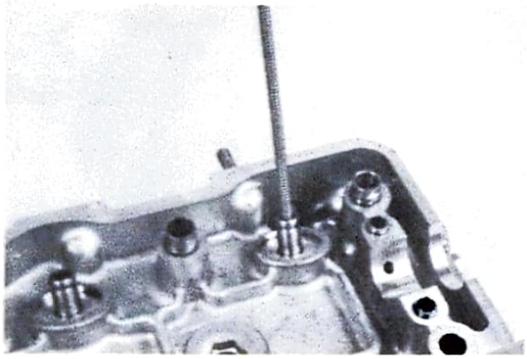


INSPECTION AND CLEANING OF CYLINDER HEAD COMPONENTS

1. CLEAN COMBUSTION CHAMBER

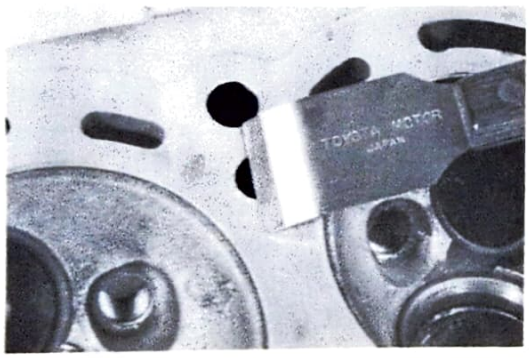
Using a wire brush, remove all the carbon from the combustion chambers.

CAUTION: Be careful not to scratch the head gasket surface.



2. CLEAN VALVE GUIDES

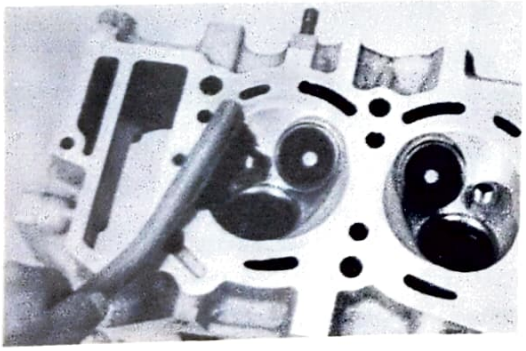
Using a valve guide brush and solvent, clean all the valve guides.



3. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from the manifold and head surfaces.

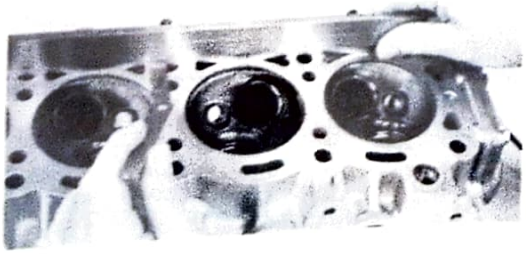
CAUTION: Do not scratch surfaces.



4. CLEAN CYLINDER HEAD

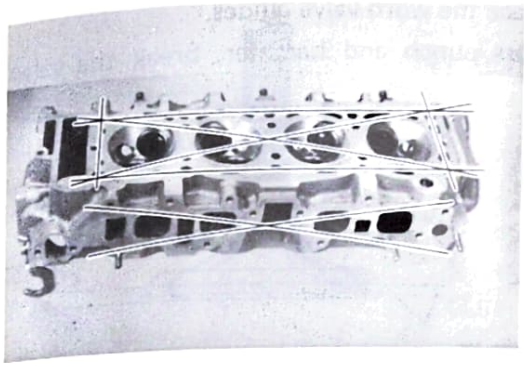
Using a soft brush and solvent, clean the head.

CAUTION: Do not clean the head in a hot tank as this would seriously damage it.



5. CHECK HEAD FOR FLATNESS

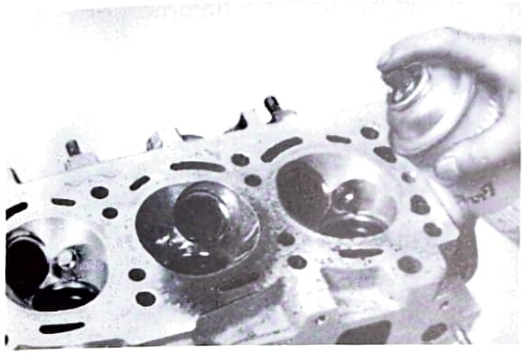
(a) Using a precision straight edge and feeler gauge, check that the head and both manifold surfaces are not warped.



(b) Measure warpage at the four sides and diagonals as illustrated.

If warpage is greater than specified value, correct by machining or replace the head.

Maximum head surface warpage:	0.15 mm (0.0059 in.)
Maximum manifold surface warpage:	0.2 mm (0.008 in.)



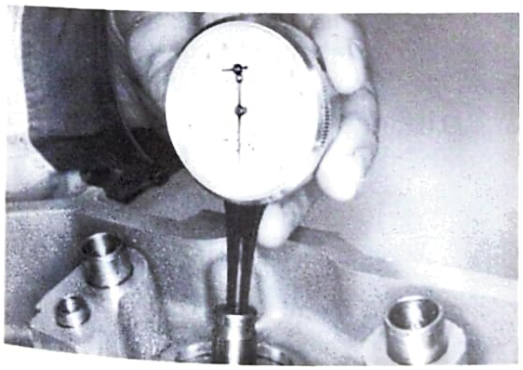
6. CHECK CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

If a crack is found, replace the head.

7. CLEAN VALVES

Use an old valve to chip any carbon from the valve head.



8. CHECK VALVE STEM GUIDE WEAR

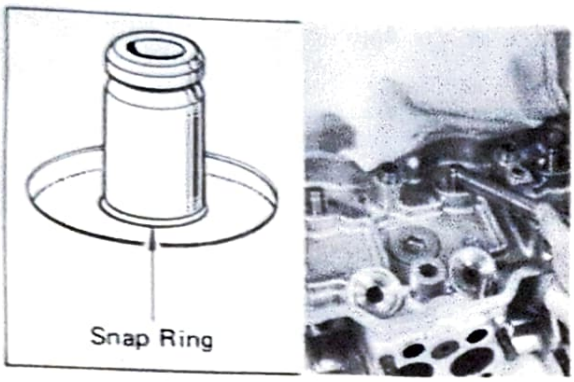
(a) Using a dial indicator or telescoping gauge, measure the inside diameter of the valve guide.

(b) Using a micrometer, measure the diameter of the valve stem.

(c) Subtract the valve stem measurement from the valve guide measurement.

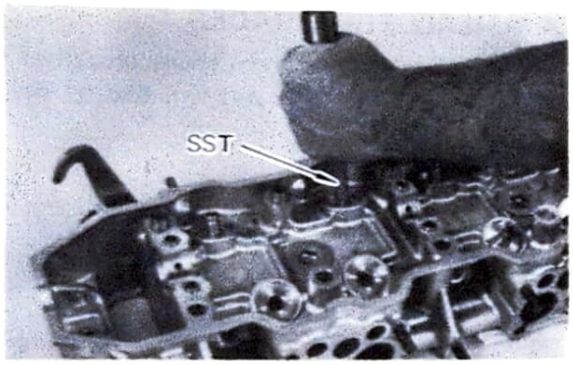
If the clearance is greater than the following values, replace the valve and guide:

Maximum intake clearance:	**0.08 mm (0.0031 in.)**
Maximum exhaust clearance:	**0.10 mm (0.0039 in.)**



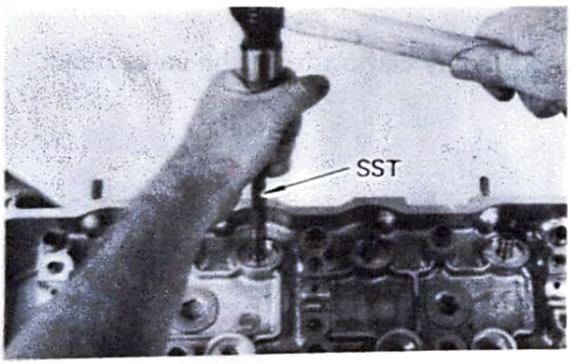
If necessary, replace the worn valve guides.

(a) Using a brass punch and hammer, break the valve guide.



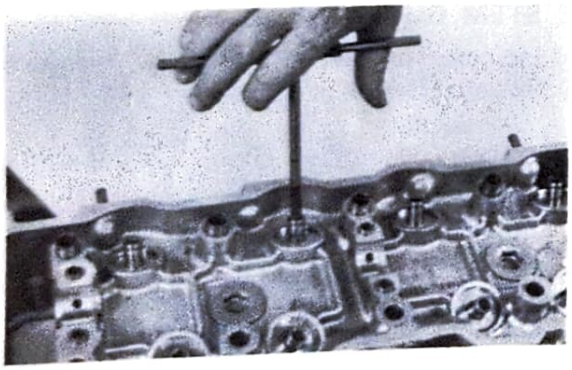
(b) Using a valve guide remover* and hammer, drive out the valve guide.

*SST 09201-60011



(c) Using the valve guide replacer* and hammer, drive in the new valve guide until the snap ring contacts the cylinder head.

*SST 09201-60011



(d) Using a sharp 8 mm reamer, ream the valve guide to obtain specified clearance between the guide and new valve.

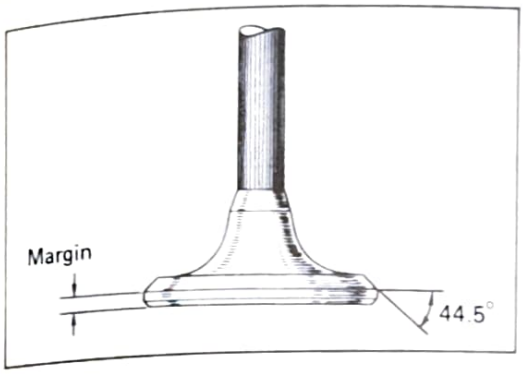
Intake clearance:	**0.02 – 0.06 mm (0.0008 – 0.0024 in.)**
Exhaust clearance:	**0.03 – 0.07 mm (0.0012 – 0.0028 in.)**

9. CHECK AND GRIND VALVES

(a) Grind valves only enough to remove pits and carbon.

Make sure the valves are ground at the correct valve face angle.

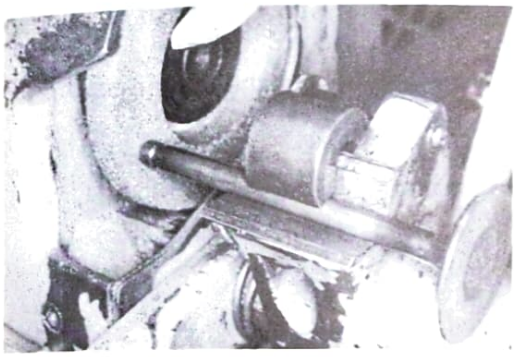
Valve face angle: 44.5°



(b) Check the valve head margin.

If the valve head margin is less than specified, replace the valve.

Minimum margin: 0.6 mm (0.024 in.)



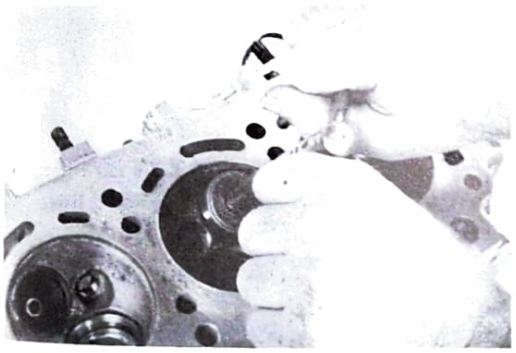
(c) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder.

CAUTION: Do not grind more than 0.5 mm (0.020 in.).

10. CHECK AND CLEAN VALVE SEATS

(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



(b) Check the valve seating position.

Apply a thin coat of prussian blue (or white lead) to the valve face. Install the valve. While applying light pressure to the valve, rotate the valve against the seat. Check the valve face and seat for the following:

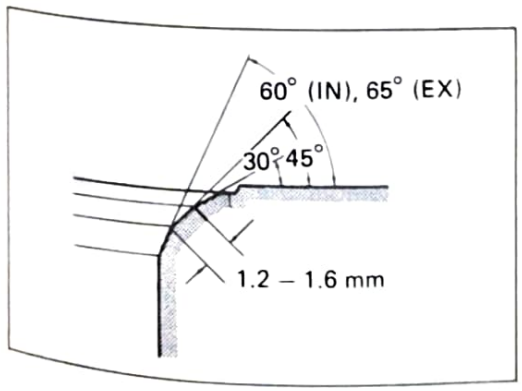
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and seat are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width:

  1.2 – 1.6 mm (0.047 – 0.063 in.)

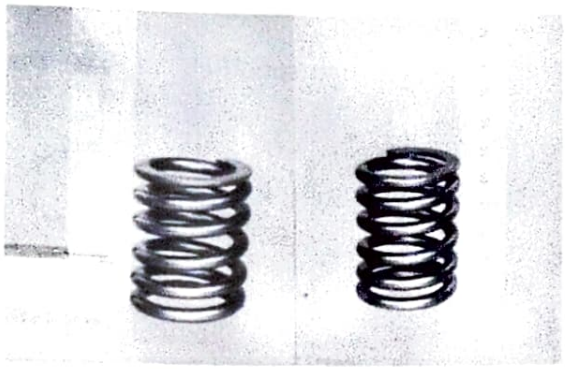
  If not, correct the valve seat as follows:

  If seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

  If seating is too low on the valve face, use 60° (IN) or 65° (EX) and 45° cutters to correct the seat.



(c) Hand-lap the valve and valve seat together with abrasive compound.



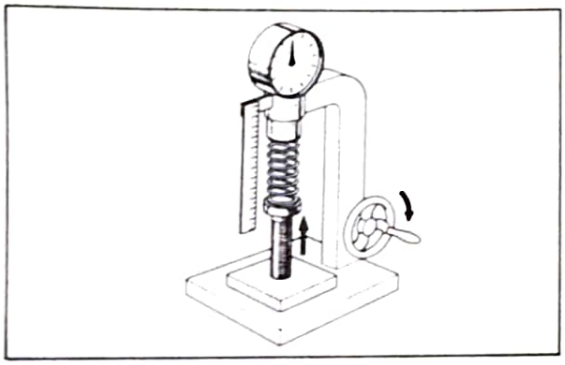
11. CHECK VALVE SPRING

(a) Using a steel square, check the squareness of the valve springs. If a spring is out of square more than the maximum allowable, replace the spring.

Maximum allowable: 1.6 mm (0.063 in.)

(b) Measure the free height of all springs. Replace any spring that is not correct.

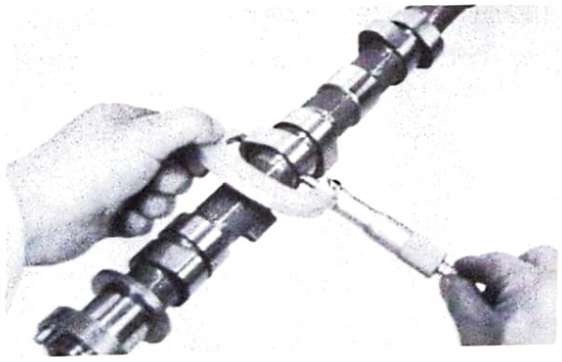
Free height: 45.8 mm (1.803 in.)



(c) Using a spring tester, check the tension of each spring at the specified installed height.

If the installed tension is less than the minimum, replace the spring.

Installed height: 40.5 mm (1.594 in.)
Minimum installed tension: 22.5 kg (49.6 lb)



12. CHECK CAMSHAFT

(a) Using a micrometer, measure the cam lobes.

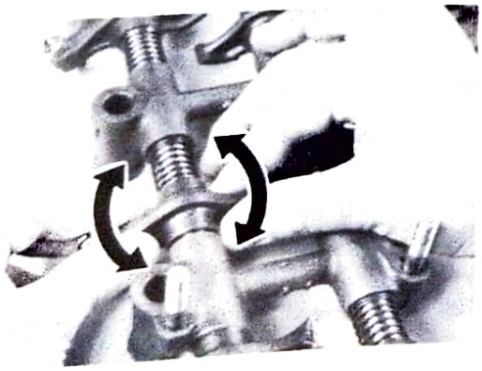
If the lobe height is less than the minimum allowable, the camshaft is worn and must be replaced.

Minimum intake lobe height: 42.63 – 42.72 mm (1.6783 – 1.6819 in.)
Minimum exhaust lobe height: 42.69 – 42.78 mm (1.6807 – 1.6842 in.)

(b) Place the camshaft on V-blocks and measure the runout at the center journal.

If the runout is greater than the maximum allowable replace the camshaft.

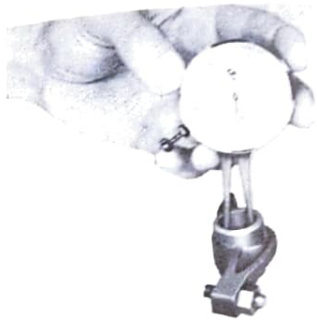
Maximum runout: 0.2 mm (0.008 in.)



13. INSPECT ROCKER ARMS

Check the clearance between the rocker arms and shaft by moving the rocker arms as shown. Little or no movement should be felt.

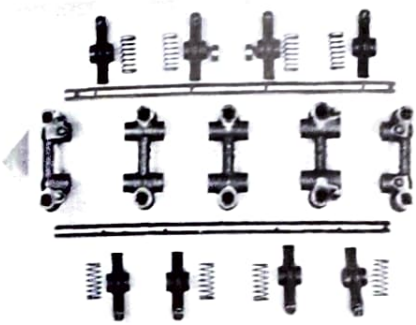
If movement is felt, disassemble the rocker arm assembly and measure the oil clearance as follows:



(a) Using a dial indicator, measure the inside diameter of the rocker arm. Using a micrometer, measure the outside diameter of the shaft. Subtract the shaft diameter from the rocker arm diameter.

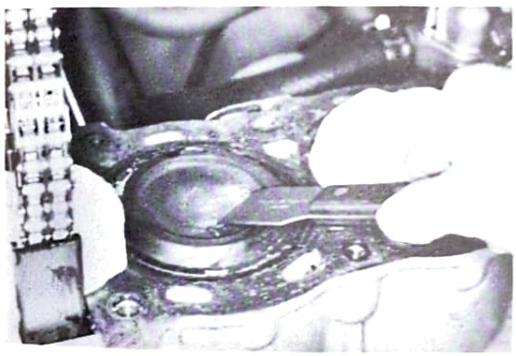
If the oil clearance is not within specification, replace the rocker arm and/or shaft.

Maximum oil clearance: 0.08 mm (0.0031 in.)



(b) Assemble the rocker arm assembly as shown, and install three screws. The arrow indicates the front of the engine.

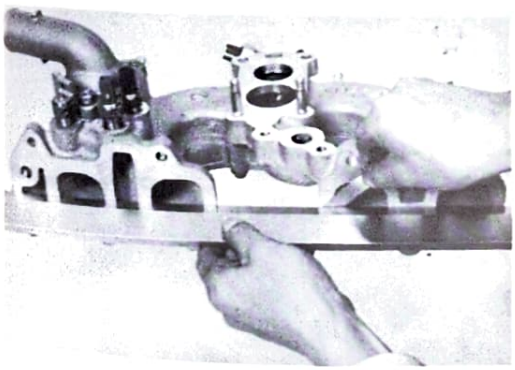
NOTE: All rocker arms are the same. All rocker stands are different and must be assembled in the correct order.



14. CLEAN TOP OF PISTONS AND TOP OF BLOCK

(a) Turn the crankshaft and bring each piston to top dead center. Scrape the carbon from the piston top.

(b) Remove all gasket material from the top of the block. Blow carbon and oil from the bolt holes.



15. INSPECT INTAKE AND EXHAUST MANIFOLDS

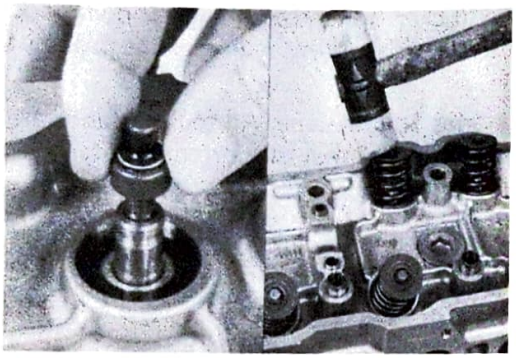
(a) Inspect manifolds for corrosion, cracks, clogged coolant passages and leaking coolant fittings. Replace as necessary.

(b) Using a precision straight edge and feeler gauge, check the surfaces contacting the cylinder head for warpage. If warpage is greater than maximum, replace manifold.

Maximum intake warpage: 0.2 mm (0.008 in.)
Maximum exhaust warpage: 0.7 mm (0.028 in.)

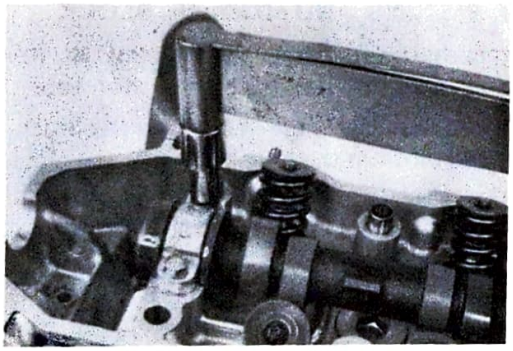
ASSEMBLY OF CYLINDER HEAD
(See illustration on page 4-3)

NOTE:
(a) Thoroughly clean all parts to be assembled.
(b) Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
(c) Replace all gaskets and oil seals with new parts.



1. INSTALL VALVES

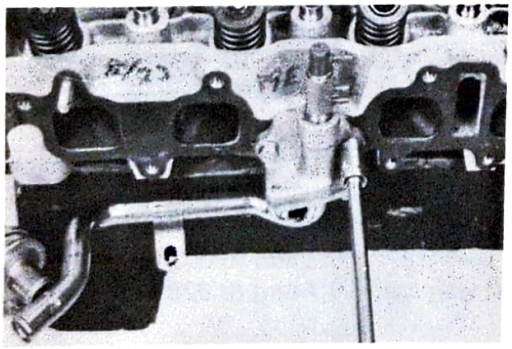
(a) Lubricate and insert valves in the cylinder head valve guides. Make sure the valves are installed in the correct order.
(b) Install the valve spring seats and seals.
(c) Install springs and spring retainers on the valves.
(d) Using a valve spring compressor, compress valve retainers and place two keepers around the valve stem. Tap the stem lightly to assure proper fit.



2. INSTALL CAMSHAFT

(a) Coat all bearing journals with engine oil.
(b) Place the camshaft in the cylinder head and install the bearing caps in numbered order from the front with arrows pointing toward the front.
(c) Install and torque the cap bolts.

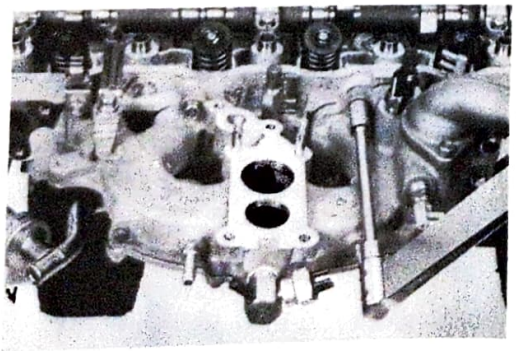
Torque: 1.7 – 2.3 kg-m (13 – 16 ft-lb)



3. INSTALL THERMOSTATIC VALVE

(a) Position a new intake manifold gasket on the cylinder head.
(b) Install the thermostatic valve with two bolts. Torque the bolts.

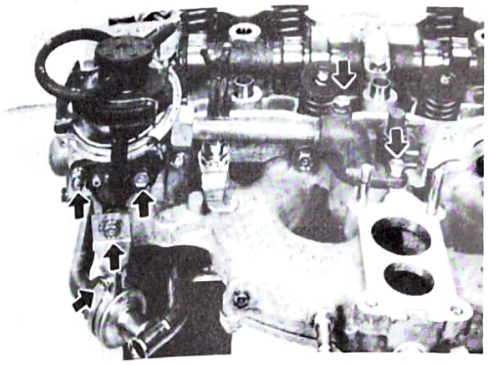
Torque: 1.7 – 2.3 kg-m (13 – 16 ft-lb)



4. INSTALL INTAKE MANIFOLD

Install the intake manifold with six bolts and two nuts. Torque the bolts and nuts.

Torque: 1.8 – 2.6 kg-m (14 – 18 ft-lb)



5. INSTALL EGR VALVE WITH VACUUM MODULATOR

(a) Position a new gasket on the cylinder head.

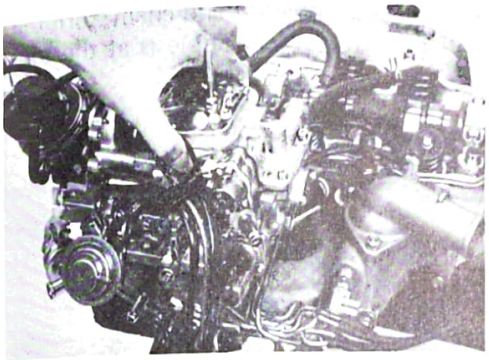
(b) Place the EGR valve in the installed position and tighten two bolts on the intake manifold side of EGR valve shaft.

(c) Apply a sealer to the upper right bolt.

(d) Torque the nut and two bolts.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

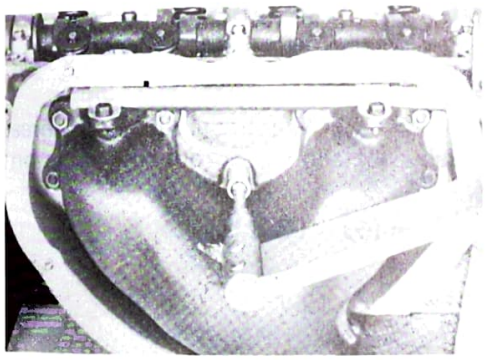
(e) Install the vacuum hose to the EGR vacuum modulator.



6. INSTALL CARBURETOR

(a) Install the carburetor to the intake manifold.

(b) Connect the vacuum hoses to the carburetor.



7. INSTALL EXHAUST MANIFOLD

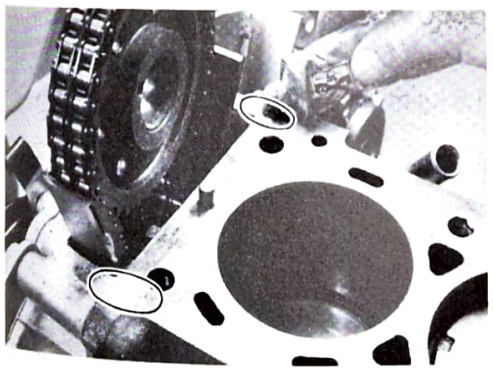
(a) Install the inner heat insulator and exhaust manifold with the air injection tube or air suction tube. Torque the seven nuts.

Torque: 4.0 – 5.0 kg-m (29 – 36 ft-lb)

(b) Install gaskets on the inner heat insulator and install the outer heat insulator with six nuts.

(c) Install the EGR valve bolt holding the air injection tube support.

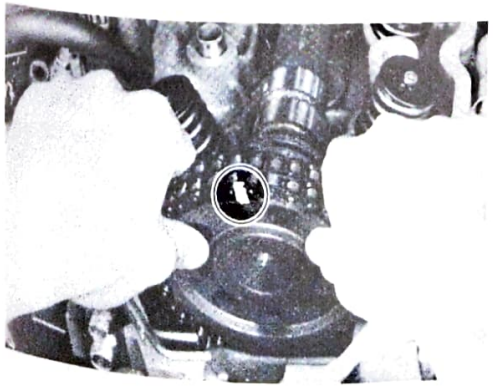
INSTALLATION OF CYLINDER HEAD



1. APPLY SEALER TO CYLINDER BLOCK

(a) Apply liquid sealer to two locations shown.

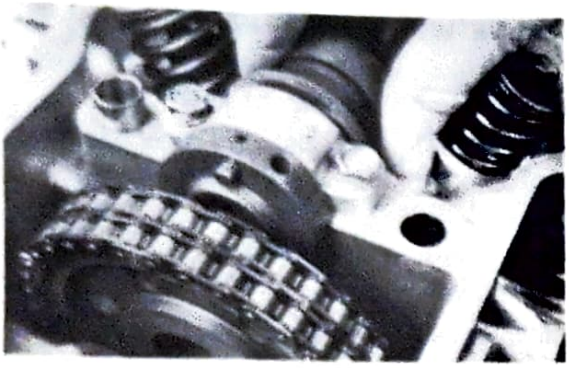
(b) Place a new head gasket over dowels on the cylinder block.



2. INSTALL CYLINDER HEAD

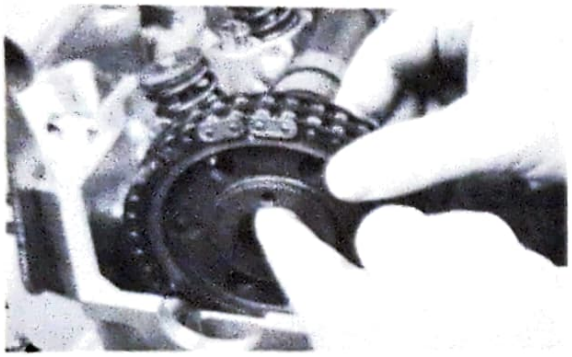
(a) If the sprocket was removed, align the alignment marks painted on the sprocket and chain during removal.

(b) Position the cylinder head over dowels on the block.

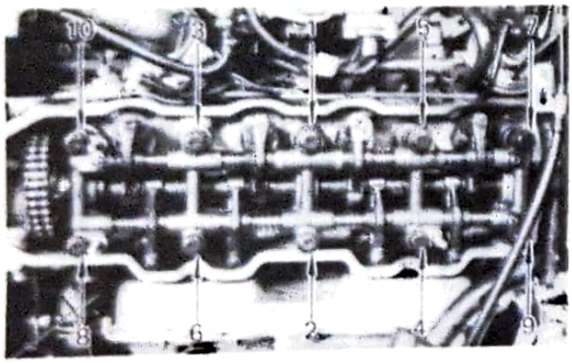


3. SET CAM TIMING

(a) Turn the camshaft to position the dowel at the top.



(b) While holding up on the sprocket and chain, turn the crankshaft until the cam sprocket hole is at the top, as shown.

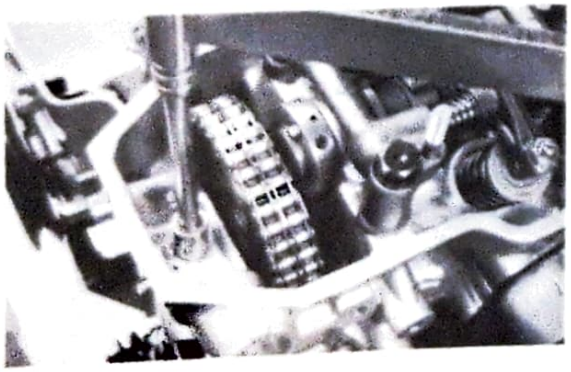


4. INSTALL ROCKER ARM ASSEMBLY

(a) Place the rocker arm assembly over the dowels on the cylinder head.

(b) Install and tighten the head bolts gradually in three passes in the sequence shown. Torque the bolts on the final pass.

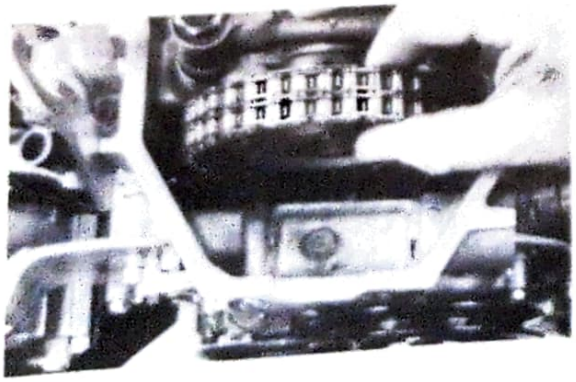
Torque: 7.2 – 8.8 kg-m (53 – 63 ft-lb)



5. INSTALL CHAIN COVER BOLT

Torque the bolt.

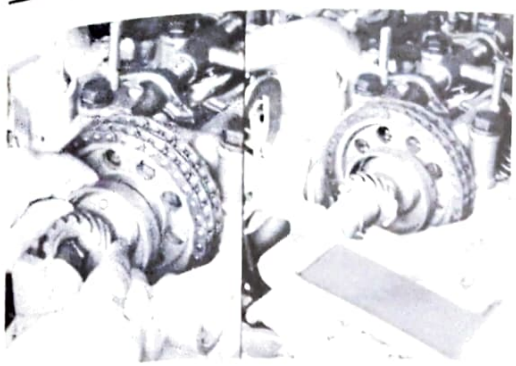
Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



6. INSTALL SPROCKET ON CAMSHAFT

Place chain sprocket over the camshaft dowel.

NOTE: If the chain does not seem long enough, turn the crankshaft back and forth while pulling up on the chain and sprocket.



7. INSTALL DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM

   Place the distributor drive gear and fuel pump drive cam over the chain sprocket.
   Torque the bolt.

   Torque: 7.0 – 9.0 kg-m (51 – 65 ft-lb)

8. ADJUST VALVES (See page 2-7)

9. INSTALL FUEL PUMP (See steps 1 through 4, page 5-3)

10. SET TIMING MARK AND INSTALL DISTRIBUTOR (See page 3-16)

11. INSTALL SPARK PLUGS AND WIRES

    Adjust the plug gap to 0.8 mm (0.031 in.) and torque the plugs.

    Torque: 1.5 – 2.1 kg-m (11 – 15 ft-lb)

12. INSTALL AIR SUCTION REAR PIPE (Fed. RN and Canada RN 4x2)

13. INSTALL EXHAUST PIPE ON EXHAUST MANIFOLD

    Torque three nuts.

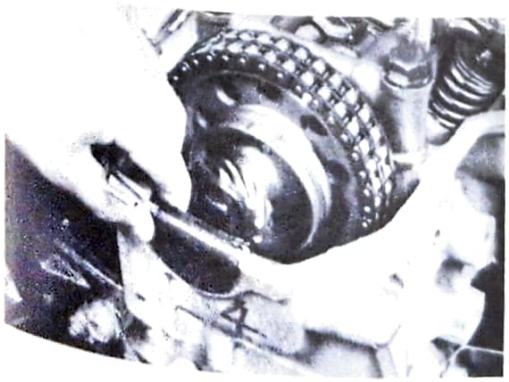
    Torque: 3.5 – 4.5 kg-m (26 – 32 ft-lb)

14. CONNECT ACCELERATOR LINKAGE TO CARBURETOR

15. CONNECT THROTTLE CABLE TO CARBURETOR (A/T Vehicles)

16. CONNECT FOLLOWING HOSES:
    (a) Emission control hoses to the carburetor and intake manifold as labeled
    (b) Hose to the air injection tube (Calif. RN and RN C&C)
    (c) Two fuel hoses to the pipes under the intake manifold
    (d) Brake booster hose to the intake manifold
    (e) Heater inlet hose to the water valve
    (f) Water by-pass hose to the intake manifold

17. CONNECT FOLLOWING WIRES:
    (a) Thermo switch wires
    (b) Carburetor wires
    (c) Bond cables to the front and rear of the cylinder head



18. CONNECT RADIATOR UPPER HOSE

19. INSTALL COVER SEALS

    Apply liquid sealer to front and rear half circle seals, and install those to the cylinder head.

20. ADD ENGINE OIL

    Pour four quarts of grade SE or better oil over distributor gear and rocket assembly. Refer to the owner's manual to select the correct weight of oil.

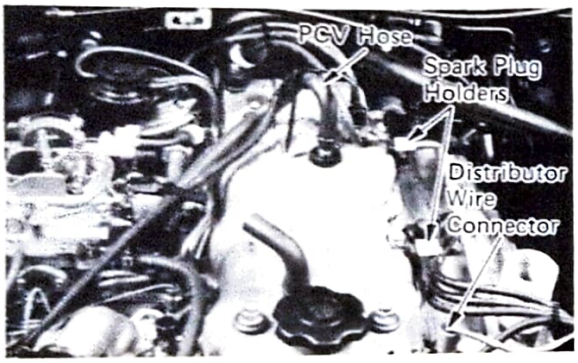
INSTALLATION OF CYLINDER HEAD COVER

1. INSTALL CYLINDER HEAD COVER

(a) Inspect rubber seals. Replace, if necessary.

(b) Place cylinder head cover on the cylinder head and install four seals and nuts. Torque the nuts.

Torque: 0.5 – 1.1 kg-m (44 – 95 in.-lb)



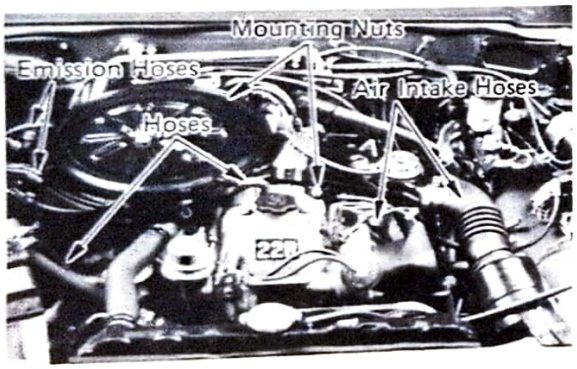
2. INSTALL FOLLOWING PARTS ON CYLINDER HEAD COVER

(a) Throttle cable for A/T

(b) Distributor wire connector

(c) Two spark plug wire holders

(d) PCV hose



3. INSTALL AIR CLEANER

(a) Place the air cleaner in position and install the two mounting nuts and butterfly nut.

(b) Connect the air intake hose.

(c) Connect the emission control hoses.

NOTE: If the cylinder head was removed, perform the following steps:

(a) Fill the radiator with approved coolant mixed to specifications.

(b) Connect the cable to the negative terminal of the battery.

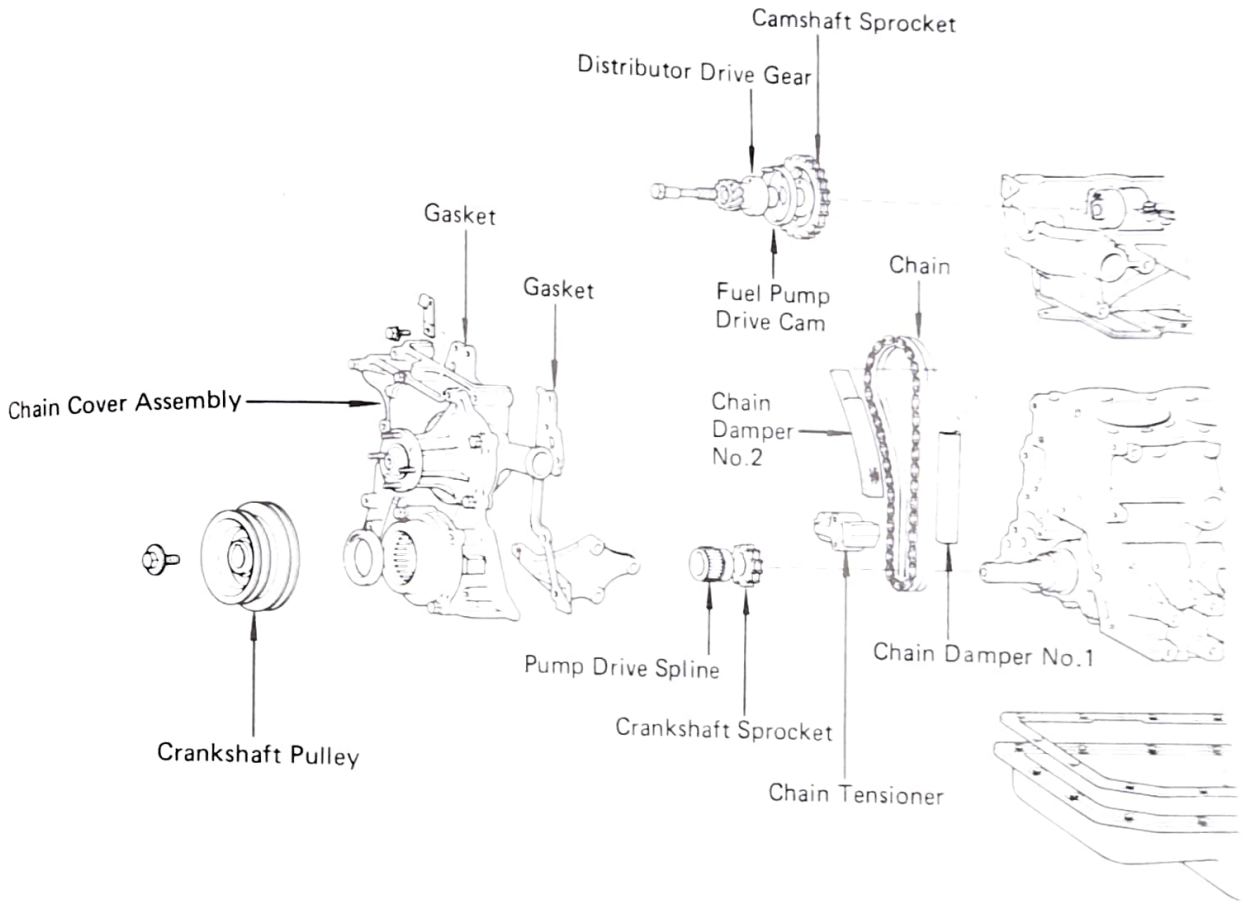
(c) Start the engine and allow it to reach operating temperature.

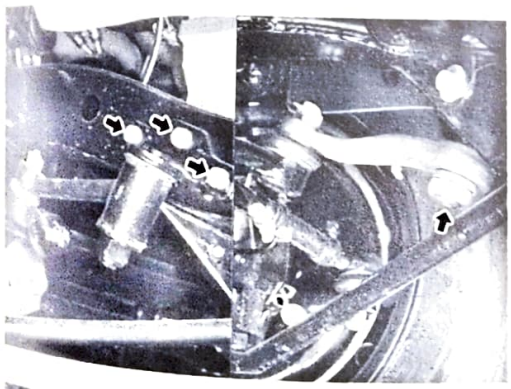
(d) Reset the timing.

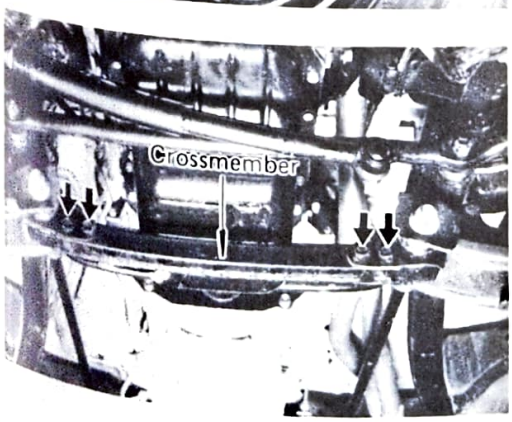
(e) Readjust the valves.

(f) Road test the vehicle and check for smooth idle and acceleration and no exhaust smoke.

TIMING CHAIN

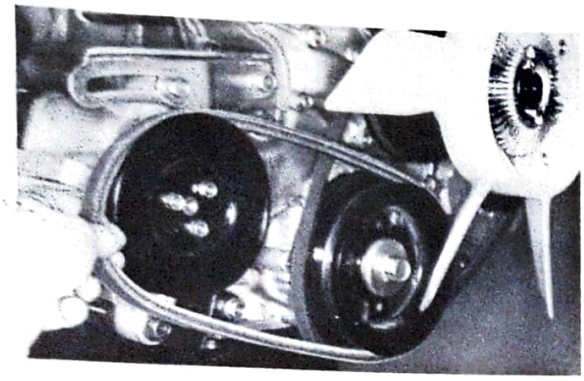




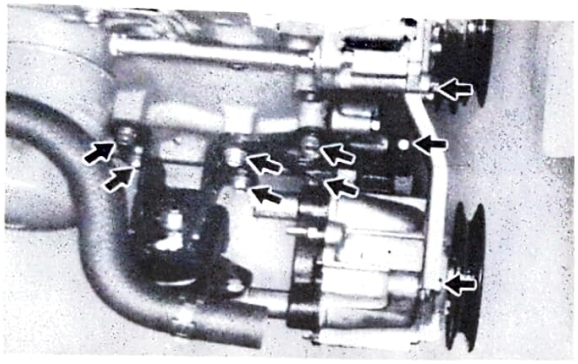


REMOVAL OF TIMING CHAIN

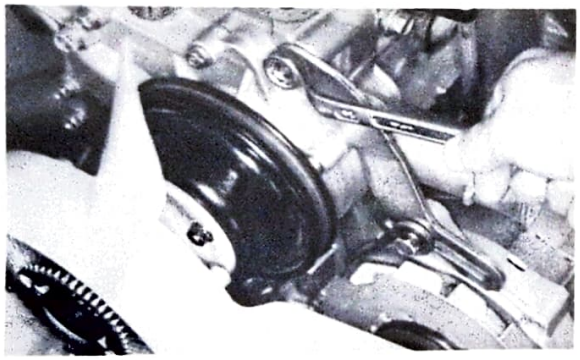
1. REMOVE CYLINDER HEAD (See page 4-4)
2. REMOVE RADIATOR (See page 6-6)
3. REMOVE OIL PAN
   (a) Remove the engine undercover.
   (b) Remove three bolts holding the steering idler arm bracket. (RN 4x2)
   (c) Remove the pitman arm from the sector shaft. (RN 4x2) (See page 16-73)
   (d) Remove four mounting bolts and crossmember. (RN 4x2)
   (e) Remove seventeen bolts and two nuts, and remove the oil pan and gasket.



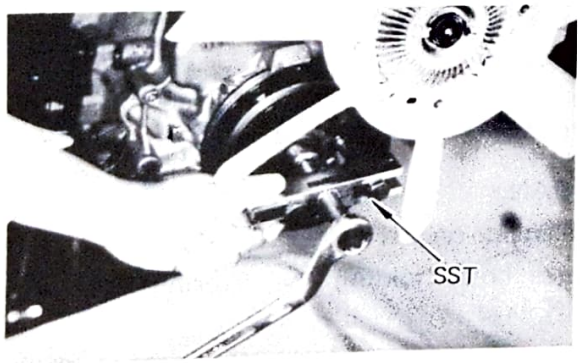
4. REMOVE DRIVE BELTS
   (a) Loosen the belt adjusting bolts and pivot bolts of the air pump and alternator.
   (b) Remove the two belts.



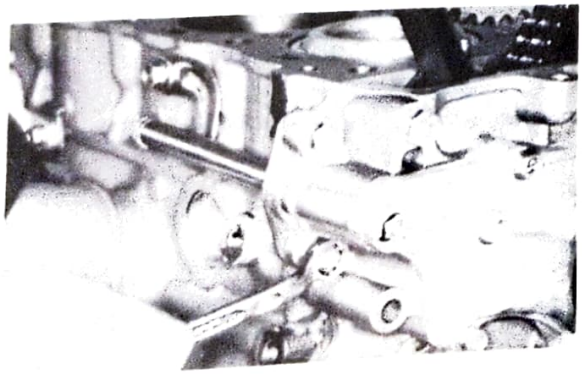
5. REMOVE AIR PUMP
   (a) Disconnect the air lines from the air pump.
   (b) Remove the adjuster bracket by removing two bolts.
   (c) Remove the front two bolts from the motor mount. Loosen the back two bolts.
   (d) Remove three bolts holding the lower air pump bracket.
   (e) Remove the bracket and air pump.



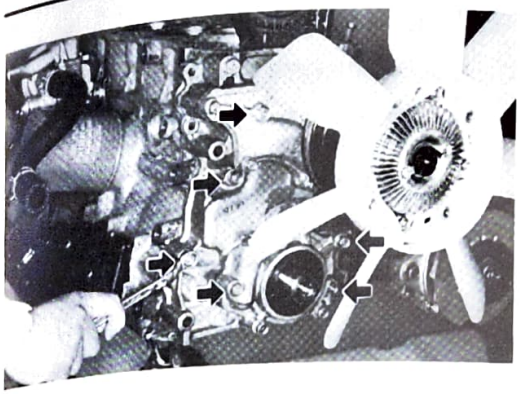
6. REMOVE ALTERNATOR ADJUSTER
   Remove the bolt holding the alternator adjuster bracket to the chain cover. Move the bracket toward the alternator.



7. REMOVE CRANKSHAFT PULLEY
   (a) Remove the pulley center bolt.
   (b) Using a puller*, remove the pulley.
   *SST 09213-31021 or Commercial puller
   NOTE: If the front seal is to be replaced, see page 4-46.



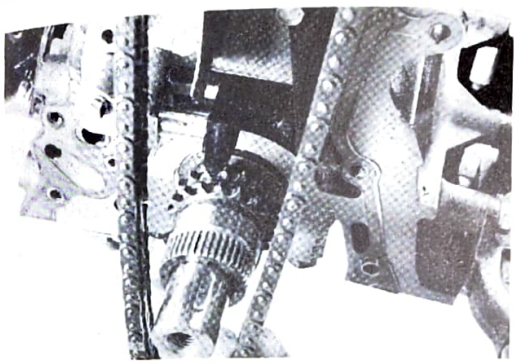
8. REMOVE WATER BY-PASS TUBE BOLTS
   Remove two bolts.



9. REMOVE CHAIN COVER ASSEMBLY

(a) Remove six timing chain cover bolts, shown by the arrows.

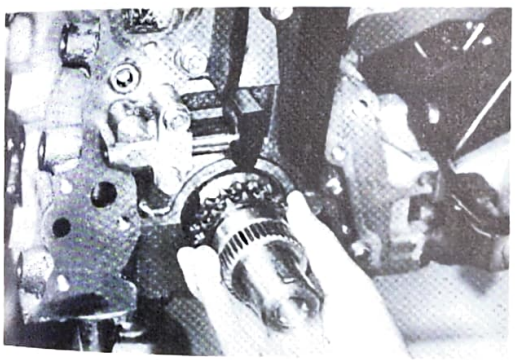
(b) Using a plastic-faced hammer, loosen the chain cover and remove it.



10. REMOVE CHAIN AND CAMSHAFT SPROCKET

(a) Remove the chain from the damper.

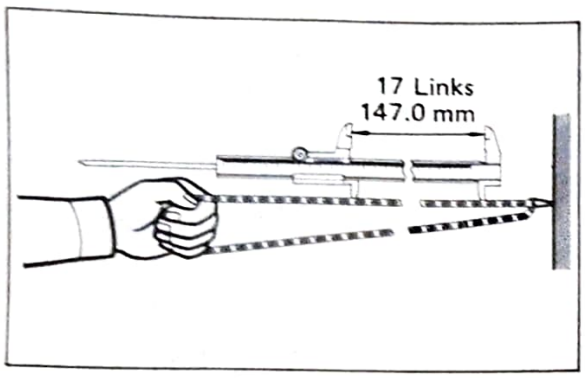
(b) Remove the cam sprocket and chain together.



11. REMOVE PUMP DRIVE AND CRANKSHAFT SPROCKET

If the pump drive and sprocket cannot be removed by hand, use a puller* to remove them together.

*SST 09213-36010 or Commercial puller



INSPECTION OF COMPONENTS

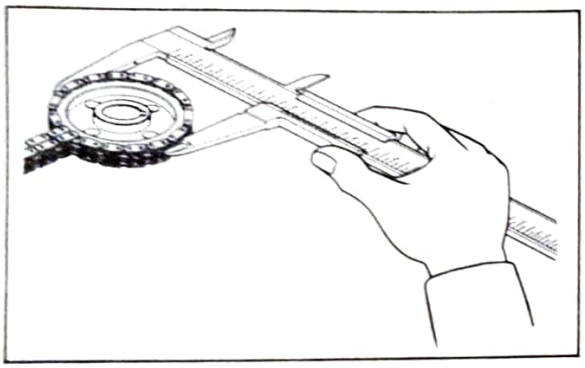
1. MEASURE CHAIN AND SPROCKET WEAR

(a) Measure the length of 17 links with the chain stretched tight with the force of one hand.

(b) Make the same measurements at more than three other places selected at random.

If over the limit at any one place, replace the chain.

Chain elongation limit at 17 links: 147.0 mm (5.787 in.)

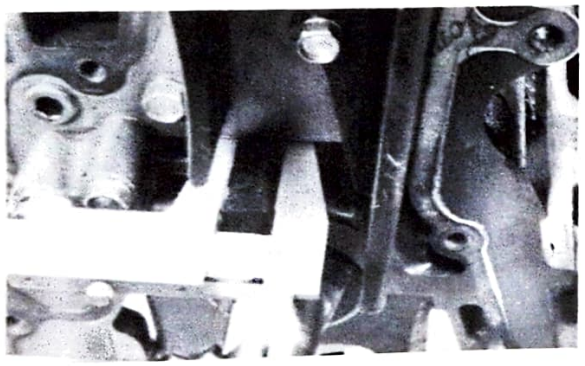


(c) Wrap the chain around the sprocket.

(d) Using a vernier caliper, measure the outer sides of the chain rollers as shown. Measure both sprockets.

If the measurement is less than the minimum, replace the chain and two sprockets.

Crankshaft sprocket minimum: 59.4 mm (2.339 in.)
Camshaft sprocket minimum: 113.8 mm (4.480 in.)



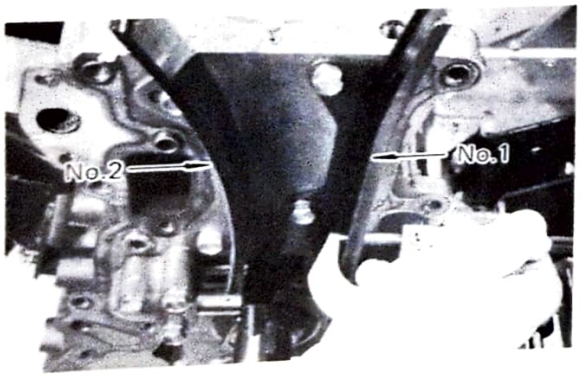
2. CHECK CHAIN TENSIONER

(a) Inspect chain tensioner for wear.

(b) Using a vernier caliper, measure the tensioner as shown.

If the tensioner is worn or less than the minimum, replace the chain tensioner.

Tensioner minimum: 11 mm (0.43 in.)

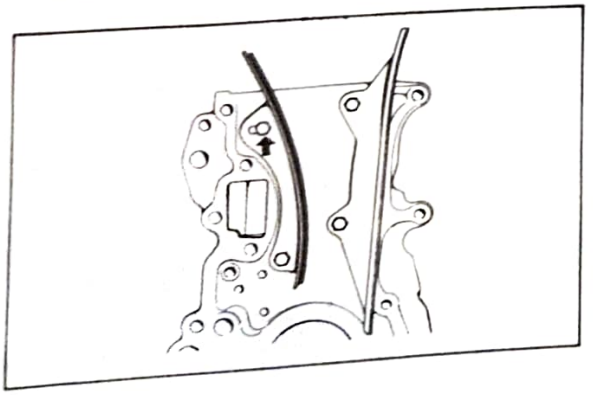


3. CHECK CHAIN DAMPERS

(a) Check chain dampers for wear.

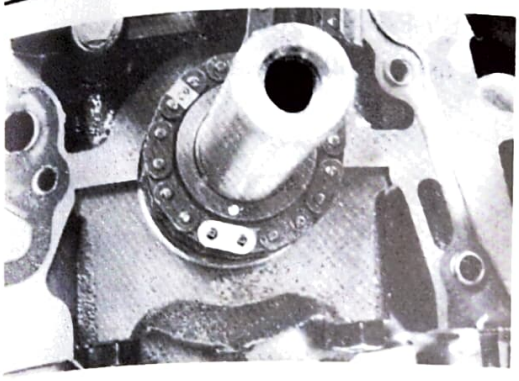
(b) Using a micrometer, measure each damper.

No.1 damper minimum: 5 mm (0.20 in.)
No.2 damper minimum: 4.5 mm (0.177 in.)



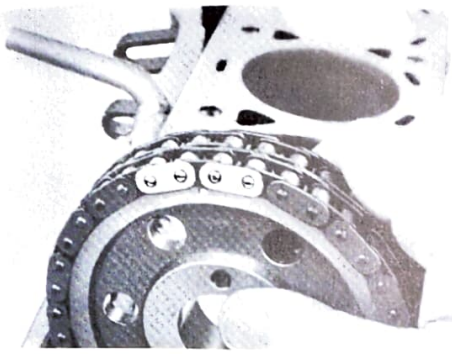
If either damper is worn or is less than the minimum, replace the damper as follows:

(c) Bolt down the new damper bolts as shown.

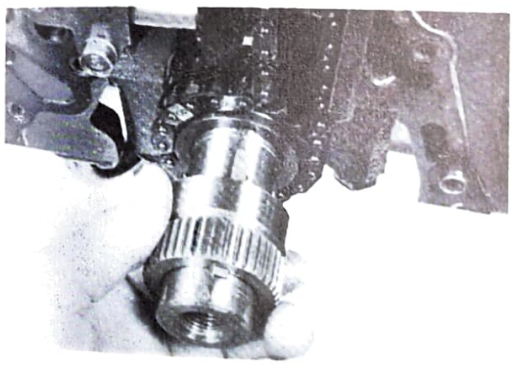


INSTALLATION OF TIMING CHAIN
(See illustration on page 4-19)

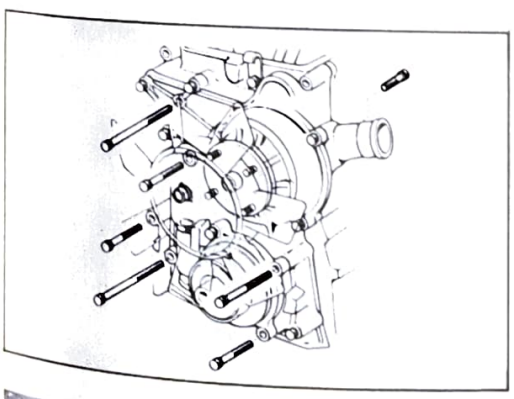
1. INSTALL CRANKSHAFT SPROCKET AND CHAIN
   (a) Turn the crankshaft until the shaft key is on the top.
   (b) Slide the sprocket over the key on the crankshaft.
   (c) Place the timing chain on the sprocket with the single bright link aligned with the timing mark on the sprocket.



2. PLACE CHAIN ON CAMSHAFT SPROCKET
   (a) Place the timing chain on the sprocket so that the timing mark is between two bright chain links.
   (b) Make sure the chain is positioned between the two dampers.
   (c) Turn the camshaft sprocket counterclockwise to take the slack out of the chain.

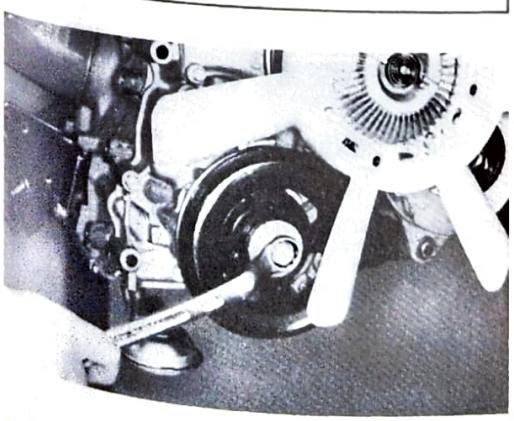


3. INSTALL OIL PUMP DRIVE
   Slide oil pump drive spline over the crankshaft key.



4. INSTALL TIMING CHAIN COVER ASSEMBLY
   (a) Remove the old cover gaskets. Clean the gasket surface. Install new gaskets over the dowels.
   (b) Slide the cover assembly over the dowels and pump spline.
   (c) Insert the bolts as shown and torque.

   Torque: 8 mm bolt 1.0 – 1.6 kg-m (8 – 11 ft-lb)
   10 mm bolt 3.5 – 5.0 kg-m (26 – 36 ft-lb)

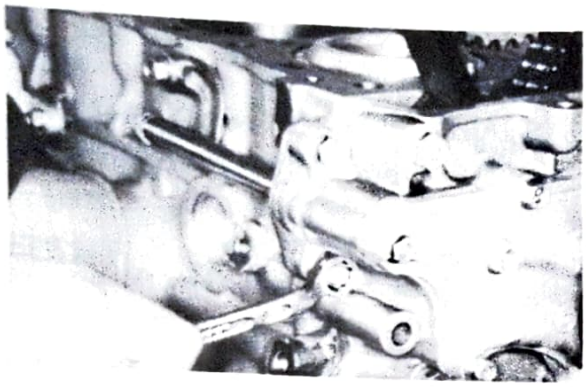


5. INSTALL CRANKSHAFT PULLEY
   (a) Install the pulley over the crankshaft key.

   CAUTION: Do not turn the crankshaft.

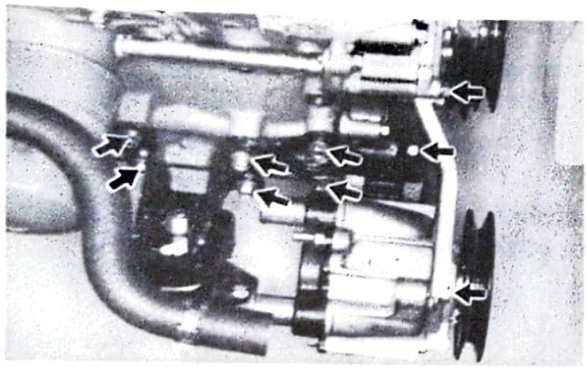
   (b) Torque the pulley center bolt.

   Torque: 14.0 – 18.0 kg-m (102 – 130 ft-lb)



6. INSTALL WATER BY-PASS TUBE

Place the new gasket and install the water by-pass tube.



7. INSTALL AIR PUMP

(a) Install the air pump and bracket with three bolts.

(b) Install the front two motor mount bolts. Tighten the back two bolts.

(c) Install the adjuster bracket with two bolts.

(d) Connect the air lines to the air pump.

8. INSTALL BOLT HOLDING ALTERNATOR ADJUSTER BRACKET TO CHAIN COVER

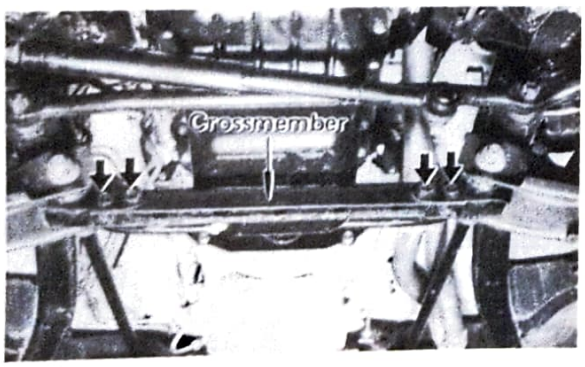
9. INSTALL DRIVE BELTS (See page 4-43)

10. INSTALL OIL PAN

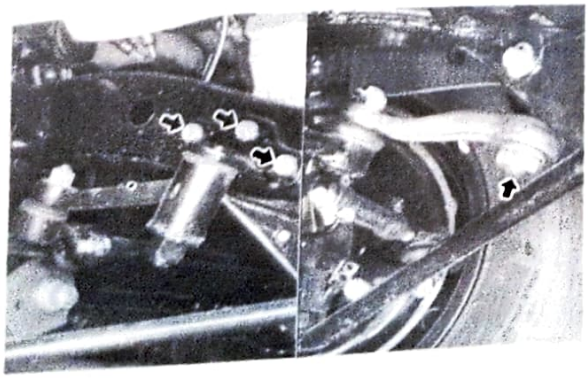
(a) Apply sealer to the new pan gasket as shown.

(b) Install the oil pan over the studs on the block with seventeen bolts and two nuts. Torque the nuts and bolts.

Torque: 0.4 – 0.8 kg-m (35 – 69 in.-lb)



(c) Install the crossmember with four bolts. (RN 4x2)



(d) Install the pitman arm to the sector shaft. (RN 4x2)

(e) Install three bolts holding the idler arm bracket. (RN 4x2)

(f) Install the engine under cover.

11. INSTALL RADIATOR (See page 6-6)

12. INSTALL CYLINDER HEAD (See page 4-15)

CYLINDER BLOCK

REMOVAL OF ENGINE

1. REMOVE HOOD

2. REMOVE BATTERY

3. REMOVE AIR CLEANER (See page 4-3)

4. DRAIN COOLING SYSTEM

   Drain coolant from the radiator and engine block.

5. REMOVE RADIATOR, SHROUD AND RADIATOR HOSES (See page 6-6)

   When removing the radiator, disconnect the heater outlet hose and oil cooler hoses for A/T from the radiator.

6. IF VEHICLE HAS AIR CONDITIONING, REMOVE DRIVE BELT AND REMOVE COMPRESSOR MOUNTING BOLTS

   Lay compressor aside without disconnecting the hoses.

7. REMOVE FAN, PULLEY AND DRIVE BELT

8. DISCONNECT FOLLOWING HOSES:

   (a) Heater inlet hose from water valve

   (b) Brake booster hose from intake manifold

   (c) Two fuel hoses from the pipes under the intake manifold

   (d) Disconnect two emission control hoses from charcoal canister and outer vent control valve.

9. DISCONNECT FOLLOWING WIRES:

   (a) Alternator wires

   (b) Bond cables from the front and rear of the cylinder head

   (c) High tension wire from the ignition coil

   (d) Distributor wire

   (e) Carburetor wires

   (f) Water temperature sending unit wire

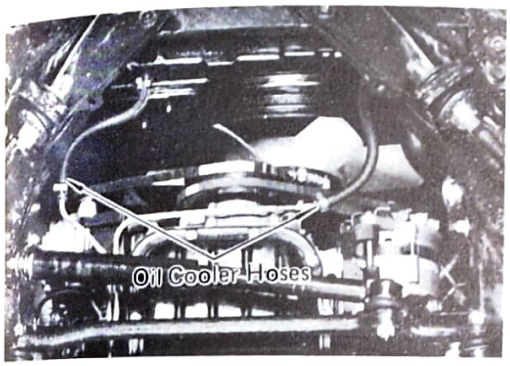
   (g) Thermo switch wire

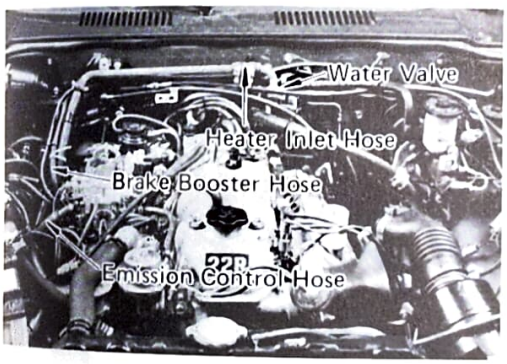
10. REMOVE VSV BRACKET AND VACUUM HOSE BRACKET

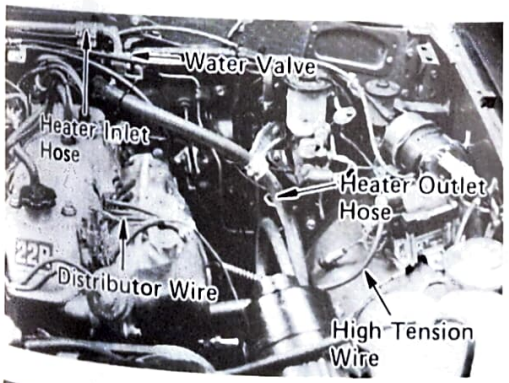
    (a) Disconnect the wires from the vacuum switch and VSVs.

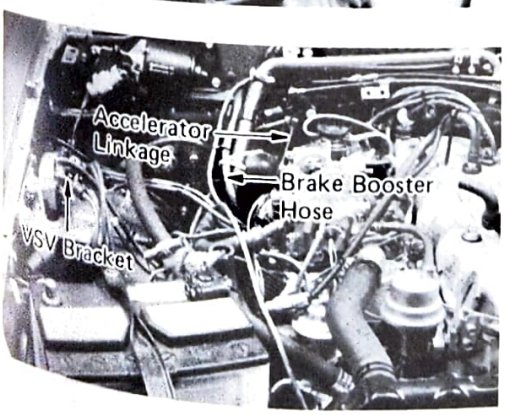
    (b) Remove the VSV bracket and vacuum hose bracket, and lay them on the engine.

11. DISCONNECT ACCELERATOR LINKAGE FROM CARBURETOR







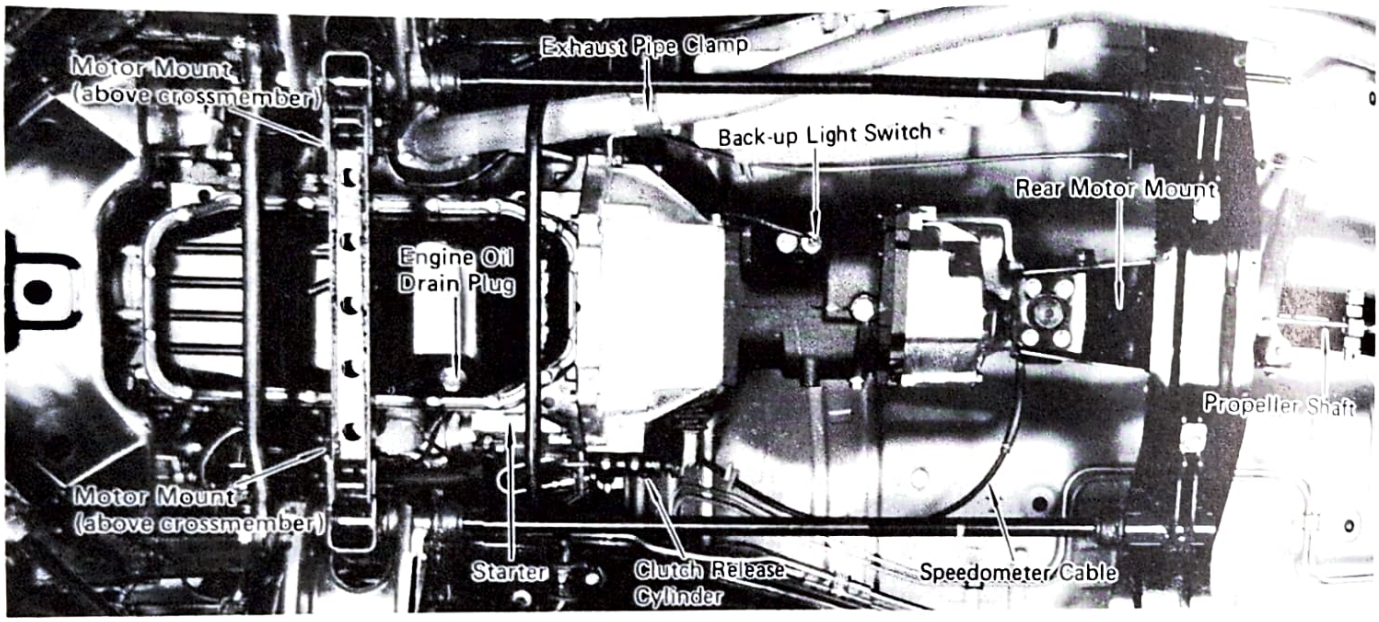


12. DISCONNECT THROTTLE CABLE FROM CARBURETOR AND VALVE COVER FOR A/T

13. REMOVE TRANSMISSION SHIFT LEVER FROM INSIDE OF VEHICLE FOR M/T (See page 9-12)

14. RAISE VEHICLE (See page 1-7)

CAUTION: Be sure the vehicle is securely supported.



15. DRAIN ENGINE OIL

16. DISCONNECT FOLLOWING WIRES:
   (a) Oil pressure switch wire
   (b) Oil pressure sending unit wire
   (c) Back-up light switch wire
   (d) Bond cable from the right engine mounting bracket
   (e) Starter wires
   (f) Neutral start switch, back-up light switch and OD solenoid wires for A/T

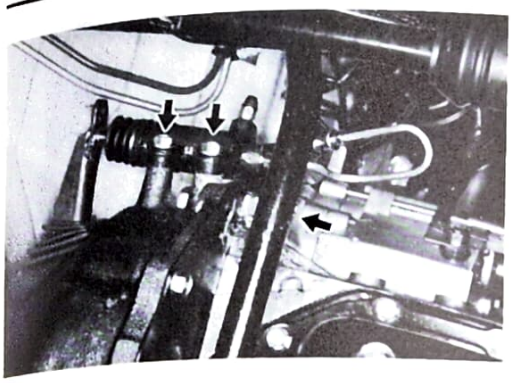
17. REMOVE PROPELLER SHAFT (See page 12-3)

18. DISCONNECT SPEEDOMETER CABLE

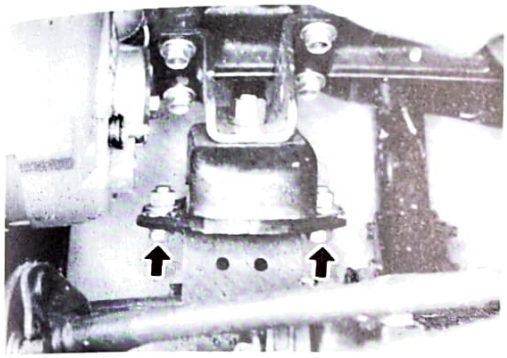
19. DISCONNECT EXHAUST PIPE CLAMP FROM TRANSMISSION HOUSING

20. DISCONNECT EXHAUST PIPE MOUNT NUTS FROM EXHAUST MANIFOLD

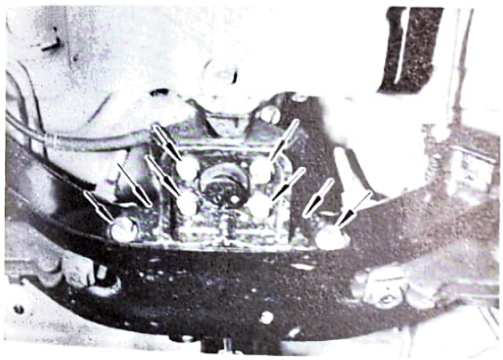
21. DISCONNECT SHIFT LINKAGE TO SHIFT LEVER FOR A/T



22. REMOVE CLUTCH RELEASE CYLINDER FOR M/T
    (a) Remove the clutch release cylinder and hose bracket mounting bolts.
    (b) Lay the release cylinder alongside the frame.

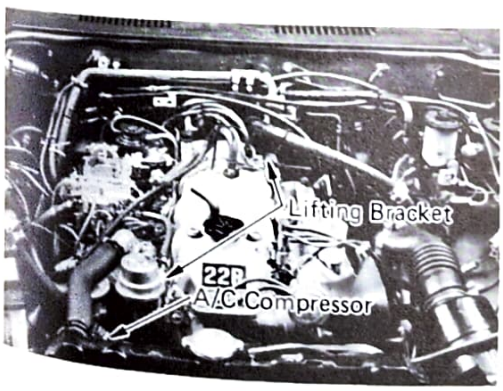


23. REMOVE ENGINE MOUNTING BOLTS ON EACH SIDE OF ENGINE



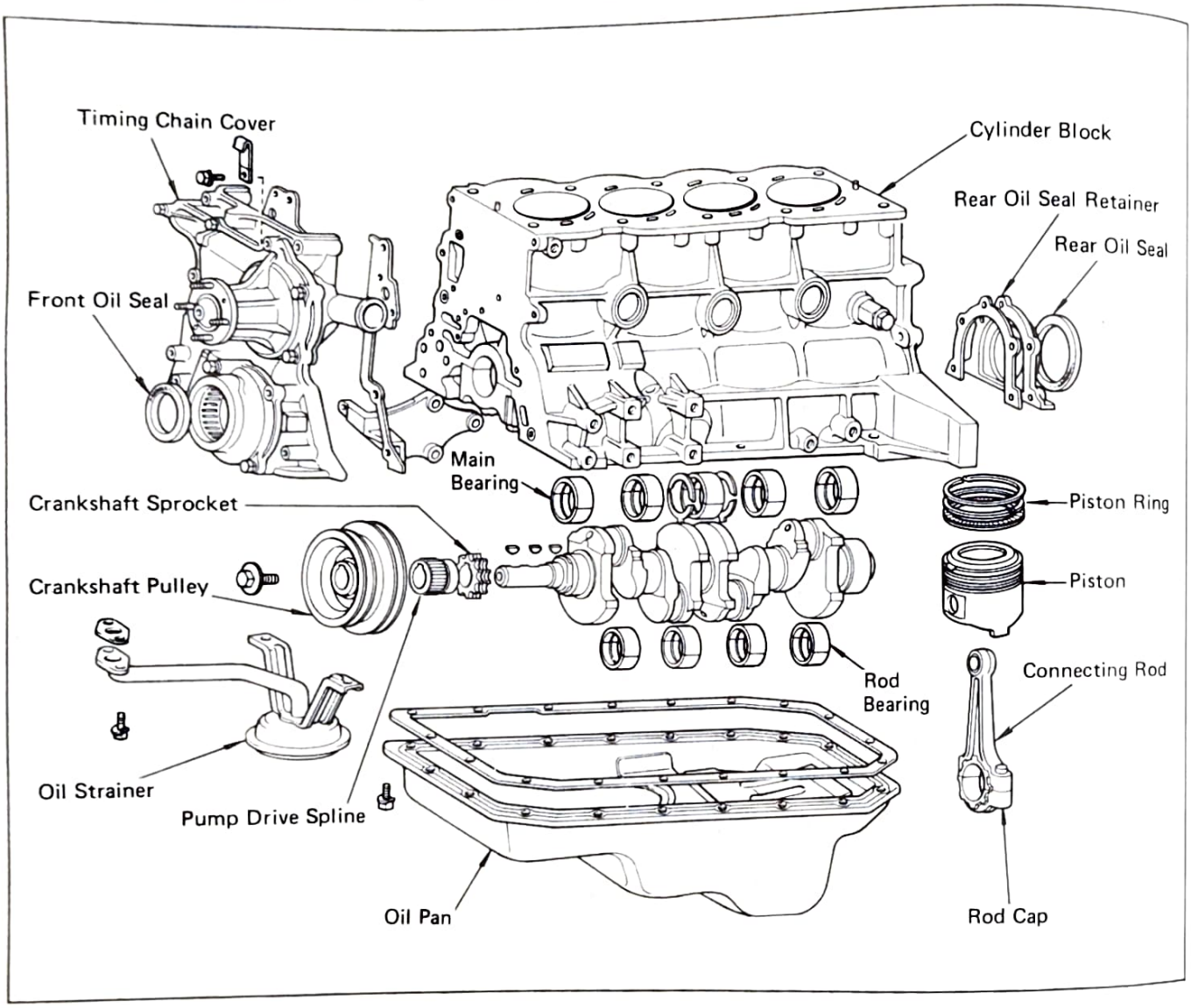
24. PLACE JACK UNDER TRANSMISSION
    Be sure to put a wooden block between the jack and the transmission pan to prevent damage.

25. REMOVE ENGINE REAR MOUNTING BRACKET FROM MEMBER



26. REMOVE ENGINE WITH TRANSMISSION FROM VEHICLE
    CAUTION: If vehicle has air conditioning, be carefull not to damage the condenser.
    (a) Attach the engine hoist chain to the lift brackets of the engine.
    (b) Lift the engine out of the vehicle slowly and carefully.
    NOTE: Make sure the engine is clear of all wiring and hoses.

27. DISCONNECT TRANSMISSION FROM ENGINE
    (a) Remove the starter.
    (b) Remove stiffener plate bolts from the transmission.
    (c) Remove the transmission housing mount bolts.
    (d) Disconnect the transmission from the engine.



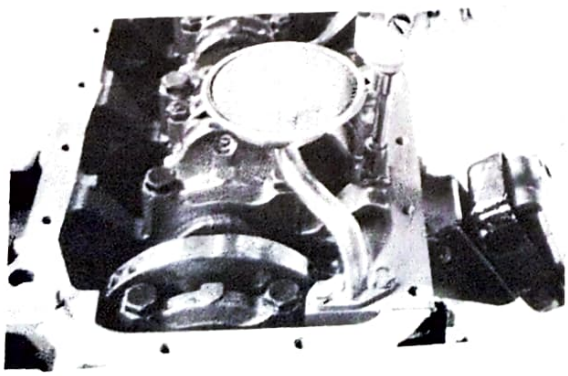
REMOVAL OF PISTON AND CONNECTING ROD ASSEMBLY

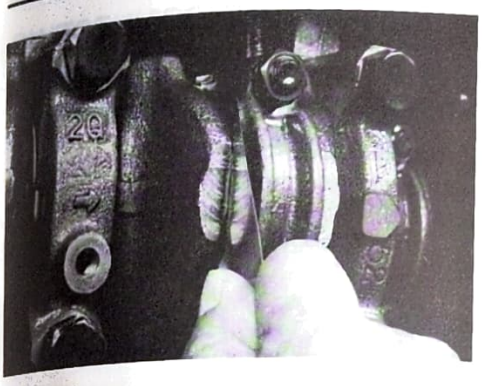
NOTE: If inspecting pistons and connecting rods or replacing bearings only, the timing chain and engine do not have to be removed.

1. REMOVE ENGINE (See page 4-25)
2. REMOVE CYLINDER HEAD (See page 4-4)
3. REMOVE TIMING CHAIN (See page 4-19)
4. REMOVE OIL STRAINER

NOTE: If the timing chain cover was not removed, remove the oil pan. (See page 4-19)

Remove four bolts holding the oil strainer.



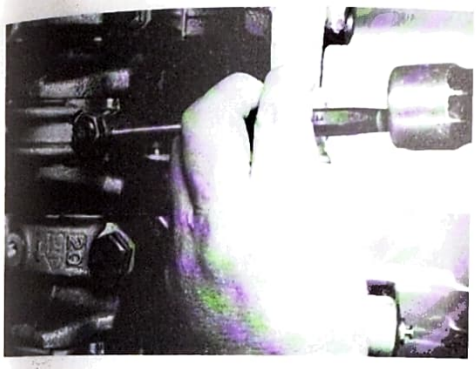


5. MEASURE CONNECTING ROD THRUST CLEARANCE

Using a feeler gauge, measure the rod thrust clearance.

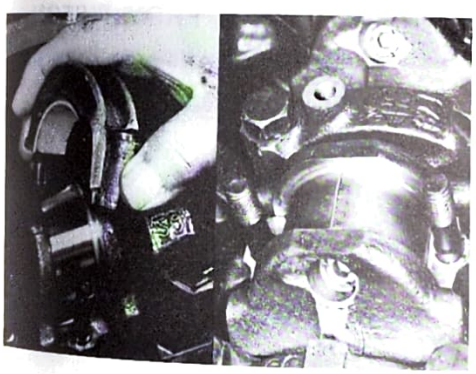
If clearance is greater than the maximum, replace the connecting rod.

Rod thrust maximum clearance: 0.3 mm (0.012 in.)



6. REMOVE ROD CAPS AND MEASURE OIL CLEARANCE

(a) Using a punch or numbering stamp, mark connecting rods and caps to ensure correct reassembly.



(b) Remove the rod caps.

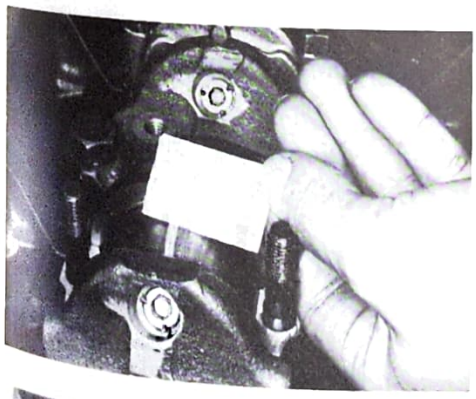
Remove the rod cap nuts. Using a plastic-faced hammer, tap the rod bolts lightly and lift off the rod cap. Keep the bearing insert with the cap.

(c) Clean the bearings and crankshaft pin.

(d) Measure the rod journal oil clearance.

- Lay a strip of Plastigage across the crankshaft pin.
- Install the rod cap. Torque the rod cap nuts.

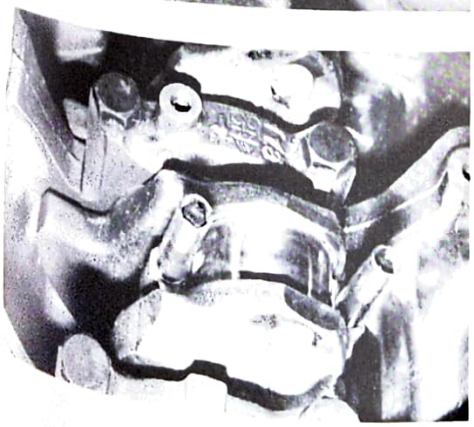
Torque: 5.7 – 6.9 kg-m (42 – 49 ft-lb)



- Remove the rod cap.
- Measure the plastigage at its widest point.

If the clearance is greater than the maximum, replace the bearings.

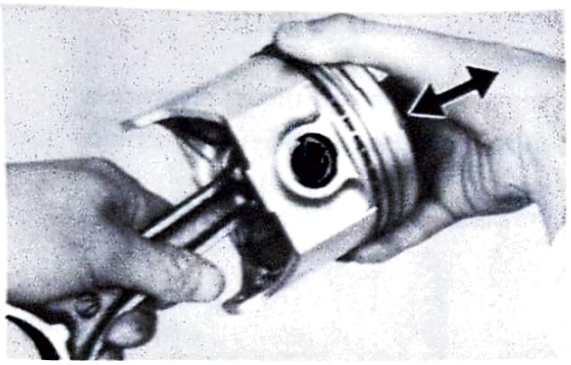
Maximum clearance: 0.1 mm (0.004 in.)
Standard clearance: 0.02 – 0.05 mm (0.0008 – 0.0020 in.)



7. PUSH OUT PISTON AND CONNECTING ROD ASSEMBLY

(a) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.

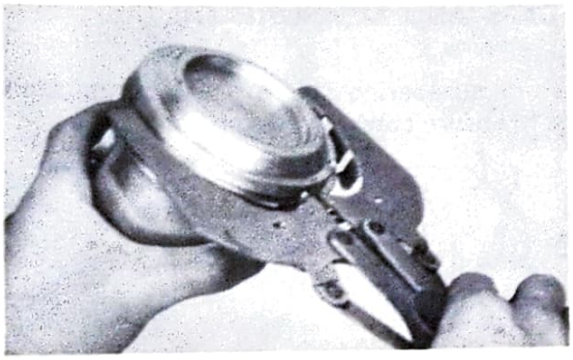
(b) Push piston and connecting rod assembly out through the top of the cylinder block.



DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

1. CHECK FIT BETWEEN PISTON AND PIN

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin.



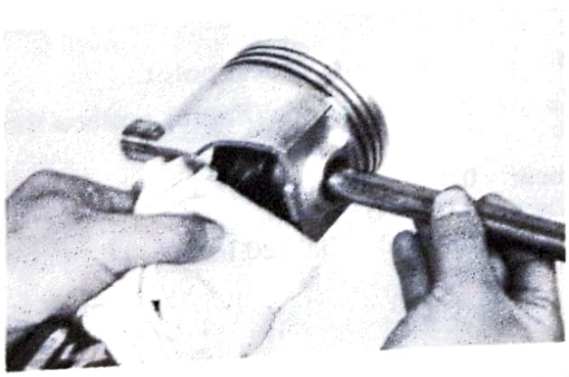
2. REMOVE PISTON RINGS

Using a piston ring expander, remove the piston rings. Keep the rings for each cylinder separated.

3. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using needle-nose pliers, remove the snap rings from the piston pin.

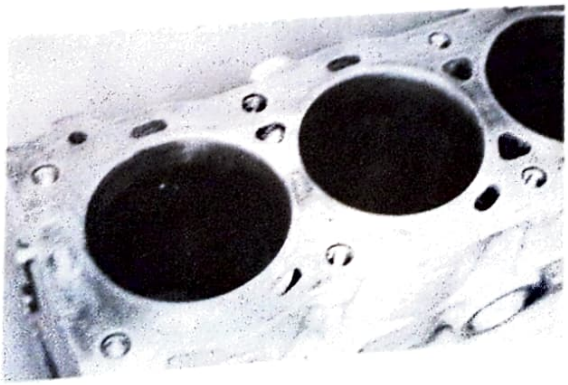
(b) Heat the piston in hot water to about 80°C (176°F).



(c) Using a plastic-faced hammer and driver, tap the pin lightly to remove the pin from the piston.

NOTE:

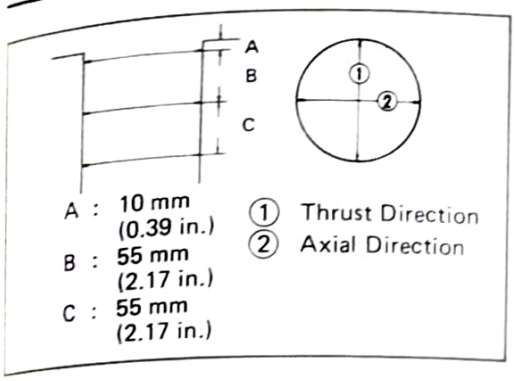
- The piston and pin are a matched set.
- Keep the piston, piston pin and rings and connecting rod together for each cylinder.



INSPECTION OF CYLINDER BLOCK

1. INSPECT CYLINDERS

Visually inspect cylinders for vertical scratches. If deep scratches are present, rebore the cylinder. (See page 4-37)



A : 10 mm (0.39 in.)
B : 55 mm (2.17 in.)
C : 55 mm (2.17 in.)

① Thrust Direction
② Axial Direction

2. MEASURE CYLINDER BORE

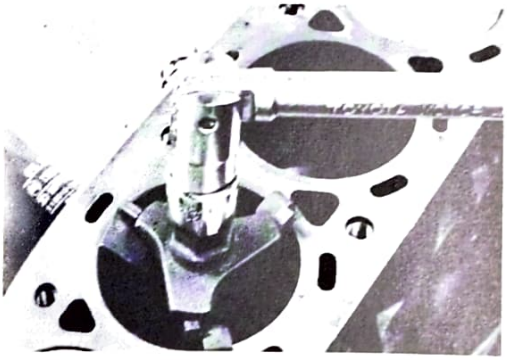
Using a cylinder micrometer, measure the cylinder bore at positions A, B and C in the thrust and axial directions.
If any of the following measurements are not within specification, rebore the cylinder. (See page 4-37)

(a) Cylinder diameter greater than maximum.

(b) Difference between A, B and C measurements greater than taper limit.

(c) Difference between thrust and axial measurements greater than out-of-round limit

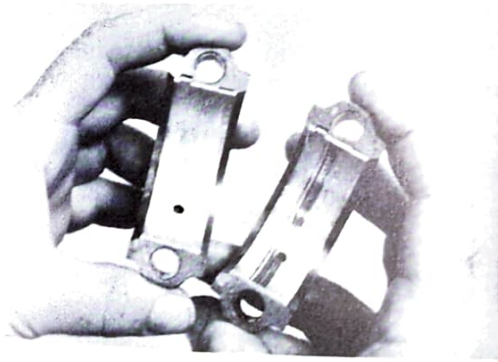
Maximum diameter: 92.23 mm (3.6311 in.)
Taper and out-of-round limit: 0.02 mm (0.0008 in.)



3. REMOVE CYLINDER RIDGE

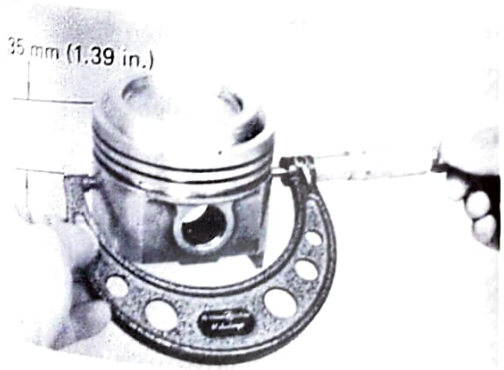
Using a ridge remover, remove the piston ring ridge from the top of the cylinders.

INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLY



1. INSPECT ROD BEARING

Inspect the rod bearings for flaking or scoring. If the bearings are damaged, replace the bearing.



2. INSPECT AND CLEAN PISTONS AND RINGS

(a) Using a micrometer, measure the piston diameter as shown.

Standard diameter: 91.938 – 91.968 mm (3.6196 – 3.6208 in.)

Check that the difference between the cylinder diameter and the piston diameter is within specification.

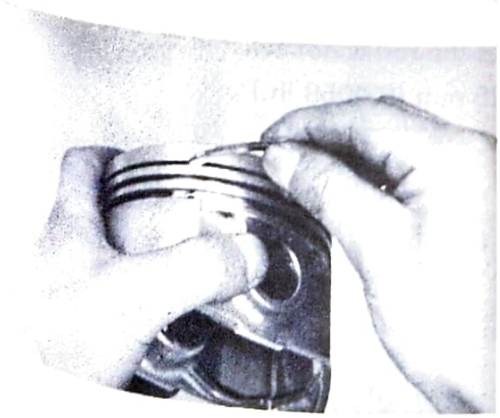
If not within specification, replace the piston and/or rebore the cylinder.

Piston clearance: 0.052 – 0.072 mm (0.0020 – 0.0028 in.)

(b) Clean the pistons as follows:

- Scrape carbon from the piston top.
- Using a groove cleaning tool or broken ring, clean the ring grooves.
- Using solvent and brush, clean the piston thoroughly.

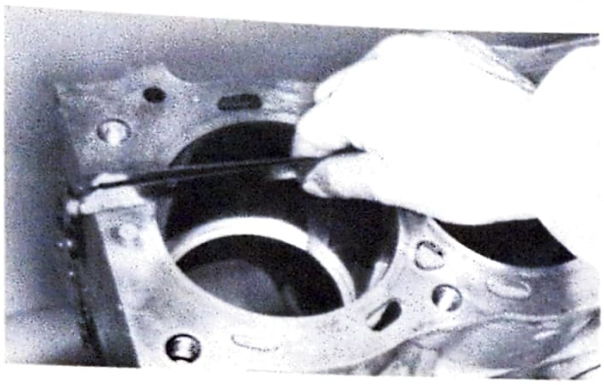
CAUTION: Do not use a wire brush.



(c) Using a feeler gauge, measure the clearance between the new piston ring and the ring land.

If the clearance is greater than the maximum, replace the piston.

Maximum clearance between compression ring No.1 or 2 and ring land: 0.2 mm (0.008 in.)



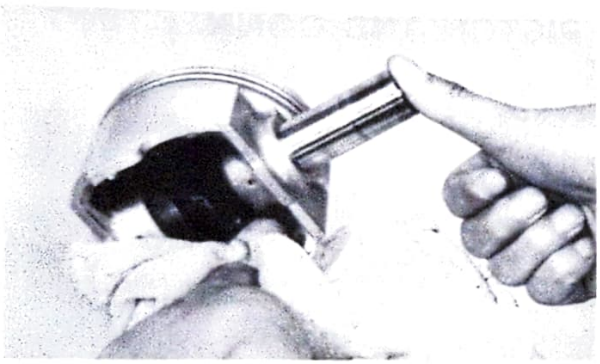
(d) Measure the ring end gap.

- Insert the compression ring into the cylinder.
- Using a piston, push the ring to the bottom of the ring travel.
- Using a feeler gauge, measure the end gap.

If not within specification, replace the ring. Do not file the ring end.

Ring end gap:

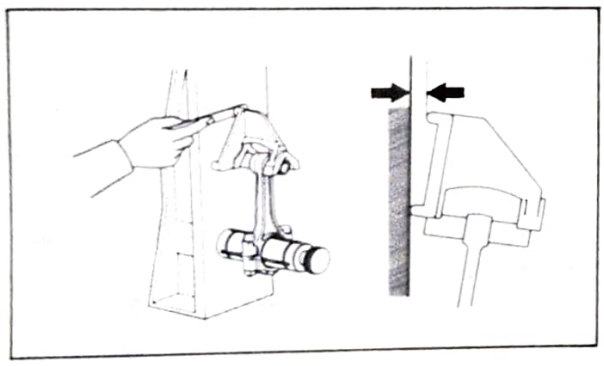
No.1 0.24 – 0.36 mm (0.0094 – 0.0142 in.)
No.2 0.18 – 0.39 mm (0.0071 – 0.0154 in.)



(e) Check the piston pin fit.

At 80°C (176°F), the pin should be able to be pushed into the piston with your thumb.

If the pin can be installed at a lower temperature, replace the piston and pin.



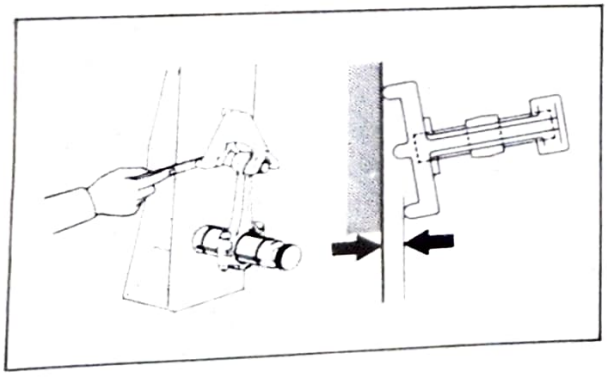
3. INSPECT CONNECTING RODS

(a) Using a rod aligner, check the connecting rod alignment.

If the rod is bent or twisted, replace the connecting rod.

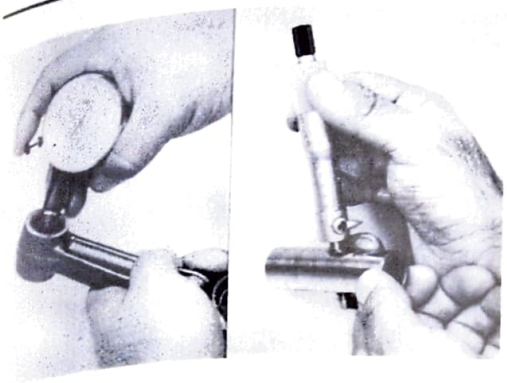
- Check that the rod is not bent.

Bend limit: 0.05 mm (0.0020 in.) per 100 mm (3.94 in.)



- Check that the rod is not twisted.

Twist limit: 0.15 mm (0.0059 in.) per 100 mm (3.94 in.)



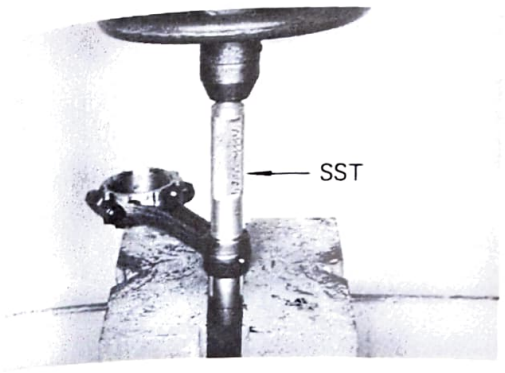
(b) Measure the oil clearance between the rod bushing and piston pin.

- Using an inside dial indicator, measure the inside diameter of the rod bushing.
- Using a micrometer, measure the diameter of the piston pin.
- Check that the difference between the measurements is less than the oil clearance limit.

If the clearance is greater than the limit, replace the rod bushing.

Oil clearance limit: 0.015 mm (0.0006 in.)

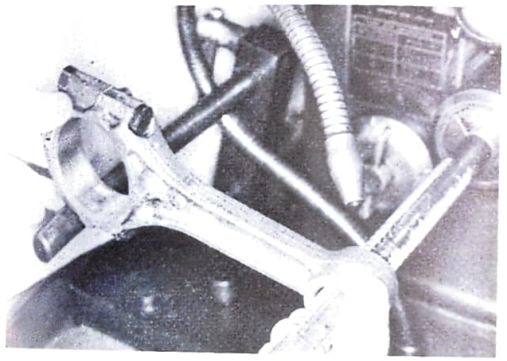
REPLACEMENT OF ROD BUSHING



1. REPLACE ROD BUSHING

Using a driver*, remove the rod bushing from the connecting rod. Install the new bushing.

*SST 09222-30010 or Commercial driver

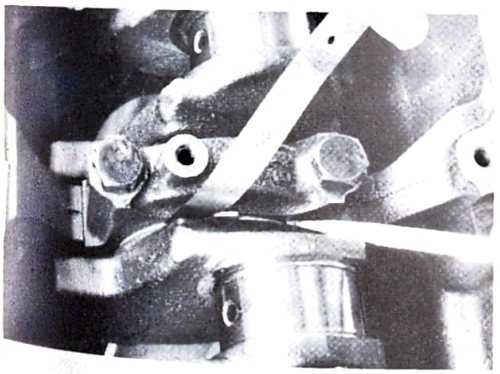


2. HONE NEW BUSHING AND CHECK PIN FIT IN CONNECTING ROD

(a) Hone the new bushing and check that the oil clearance is within standard specifications.

Oil clearance standard: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

(b) Check the pin fit at the normal room temperature. Coat the pin with engine oil and push the pin into the rod with thumb pressure.



INSPECTION OF CRANKSHAFT (Crankshaft Installed)

1. MEASURE CRANKSHAFT THRUST

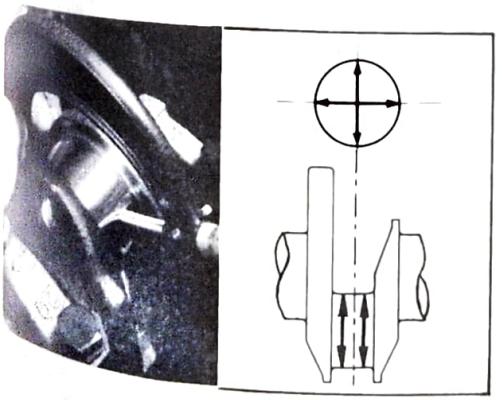
Using a feeler gauge, measure the clearance at the center bearing.

If the clearance is greater than the maximum, replace the thrust washer.

Maximum clearance: 0.3 mm (0.012 in.)

Select a thrust washer to obtain the standard clearance.

Standard clearance: 0.02 – 0.22 mm (0.0008 – 0.0087 in.)



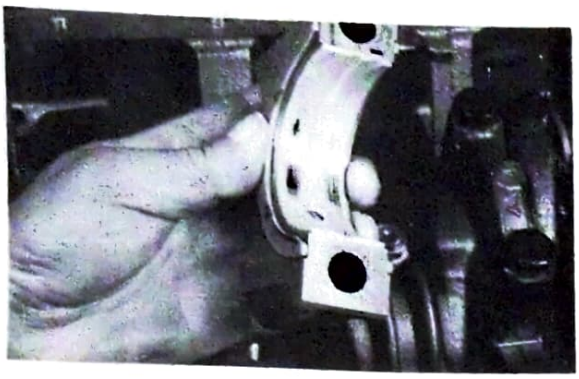
2. MEASURE CRANK PIN JOURNALS

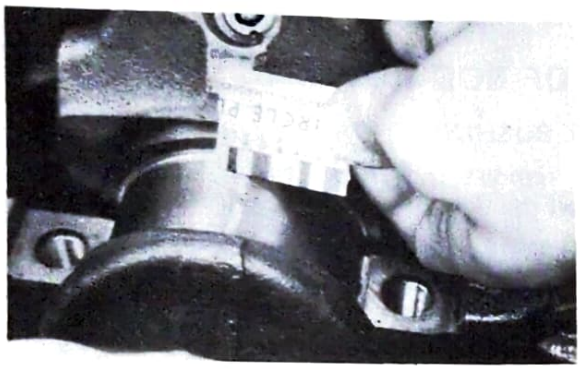
Using a micrometer, check the crank pin journal diameter. Measure the journals for out-of-round and taper as shown.

If journals are worn, regrind or replace the crankshaft.

Crank pin journal diameter: 52.99 – 53.00 mm (2.0862 – 2.0866 in.)

Taper and out-of-round limit: 0.01 mm (0.0004 in.)





3. REMOVE MAIN BEARING CAPS AND MEASURE OIL CLEARANCE

(a) Remove the main bearing caps by removing two bolts.

(b) Clean the bearings and crank pin journals.

(c) Inspect each bearing for pitting and radial scratches.

If bearings are damaged, replace the bearing.

(d) Measure the main bearing oil clearance.

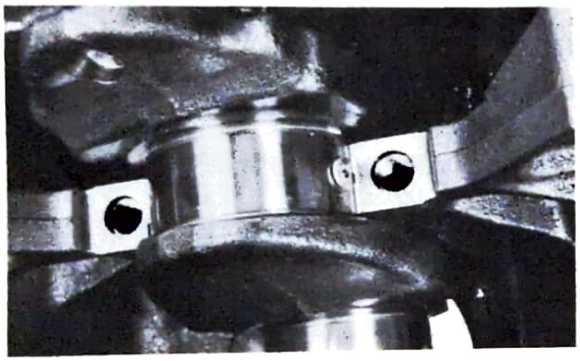
- Lay a strip of plastigage across the main journals.
- Install the main bearing caps. Torque the cap bolts.

Torque: 9.5 – 11.5 kg-m (69 – 83 ft-lb)

- Remove the main bearing caps.
- Measure the plastigage at its widest point.

If the clearance is greater than maximum, replace the main bearings.

Maximum clearance: 0.08 mm (0.0031 in.)
Standard clearance: 0.016 – 0.050 mm (0.0006 – 0.0020 in.)

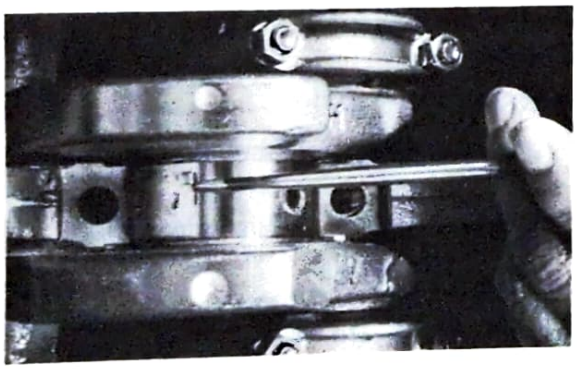


REPLACEMENT OF MAIN BEARINGS (Crankshaft Installed)

1. ROLL OUT UPPER HALF OF MAIN BEARING

(a) Insert a roll-out tool into the crankshaft journal oil hole.

(b) Turn the crankshaft slowly to roll out the upper bearing shell.



2. ROLL IN NEW BEARING

(a) Lubricate the bearing face only with engine oil.

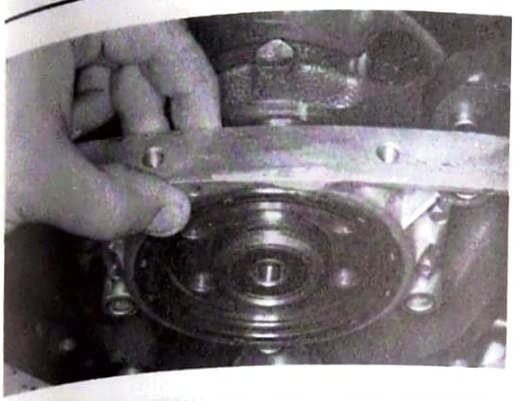
(b) Align the tab on the bearing shell with the groove in the cylinder block.

(c) Push the upper bearing shell into position.

If necessary, a punch may be used to push the shell into position.

(d) Check the main bearing oil clearance again.

If the clearance is still not within specification, the crankshaft must be removed and machined and undersized bearings installed.



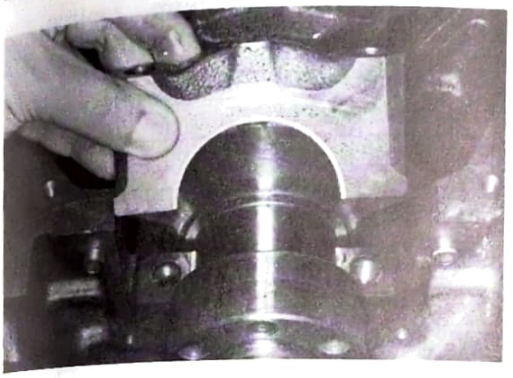
REMOVAL OF FLYWHEEL, REAR OIL SEAL AND CRANKSHAFT

1. REMOVE FLYWHEEL

Remove six bolts and the flywheel.

2. REMOVE REAR OIL SEAL RETAINER

Remove five bolts, rear oil seal retainer and gasket.

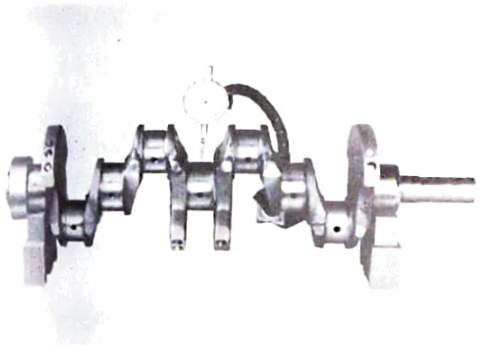


3. REMOVE CRANKSHAFT

(a) If the main bearing caps have not been removed, remove the caps.

(b) Lift out the crankshaft.

(c) Remove the upper main bearings from the cylinder block.



INSPECTION AND REPAIR OF CRANKSHAFT

1. MEASURE CRANKSHAFT

(a) Place the crankshaft on V-blocks.

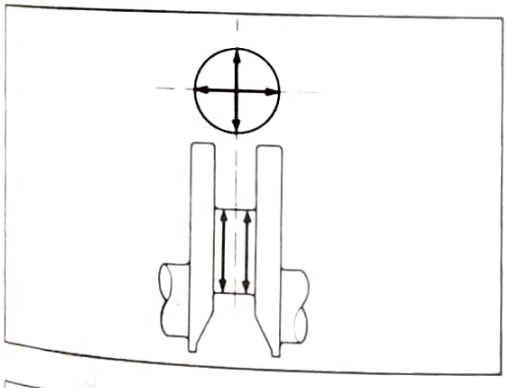
(b) Using a runout gauge, measure the runout at the center journal.

If the runout is greater than the maximum, replace the crankshaft.

Runout maximum: 0.1 mm (0.004 in.)

(c) Using a micrometer, check the diameter of the main and crank pin journal.

Measure the journals for out-of-round and taper as shown.



If journals are worn, regrind or replace the crankshaft.

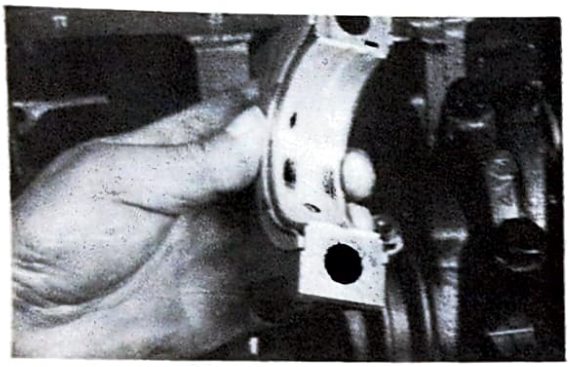
Main journal diameter:	**59.98 – 60.00 mm (2.3614 – 2.3622 in.)**
Crank pin diameter:	**52.99 – 53.00 mm (2.0862 – 2.0866 in.)**
Taper and out-of-round limit:	**0.01 mm (0.0004 in.)**

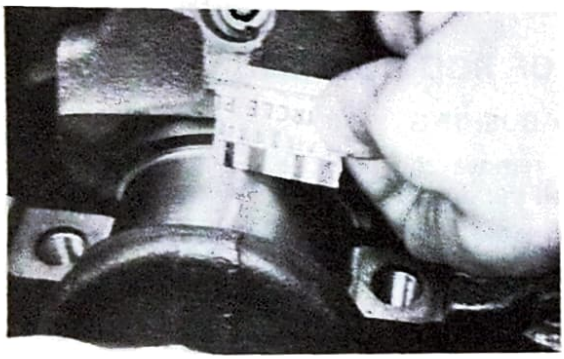
Bearing size	Crank pin finished diameter – mm (in.)
U/S 0.25	52.70 – 52.71 (2.0748 – 2.0752)

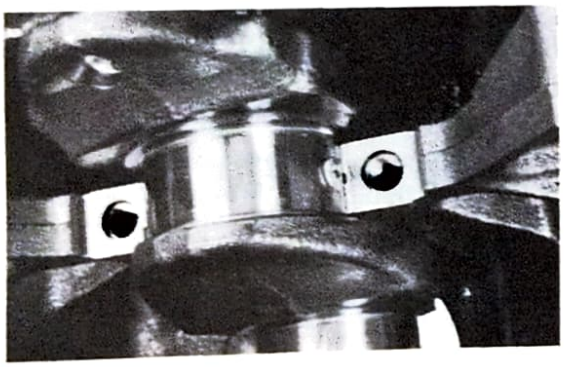
Bearing size	Main finished diameter – mm (in.)
U/S 0.25	59.70 – 59.71 (2.3504 – 2.3508)

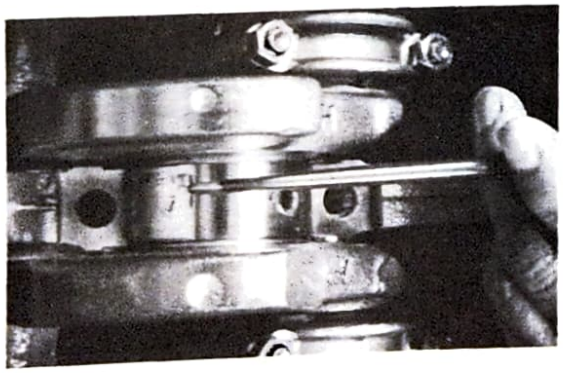
2. GRIND CRANK PIN AND/OR MAIN JOURNALS IF NECESSARY

Grind the crank pin and/or main journals to the undersized finished diameter. Install a new rod and/or main undersize bearings.









3. REMOVE MAIN BEARING CAPS AND MEASURE OIL CLEARANCE

(a) Remove the main bearing caps by removing two bolts.

(b) Clean the bearings and crank pin journals.

(c) Inspect each bearing for pitting and radial scratches.

If bearings are damaged, replace the bearing.

(d) Measure the main bearing oil clearance.

- Lay a strip of plastigage across the main journals.
- Install the main bearing caps. Torque the cap bolts.

Torque: 9.5 – 11.5 kg-m (69 – 83 ft-lb)

- Remove the main bearing caps.
- Measure the plastigage at its widest point.

If the clearance is greater than maximum, replace the main bearings.

Maximum clearance: 0.08 mm (0.0031 in.)
Standard clearance: 0.016 – 0.050 mm (0.0006 – 0.0020 in.)

REPLACEMENT OF MAIN BEARINGS (Crankshaft Installed)

1. ROLL OUT UPPER HALF OF MAIN BEARING

(a) Insert a roll-out tool into the crankshaft journal oil hole.

(b) Turn the crankshaft slowly to roll out the upper bearing shell.

2. ROLL IN NEW BEARING

(a) Lubricate the bearing face only with engine oil.

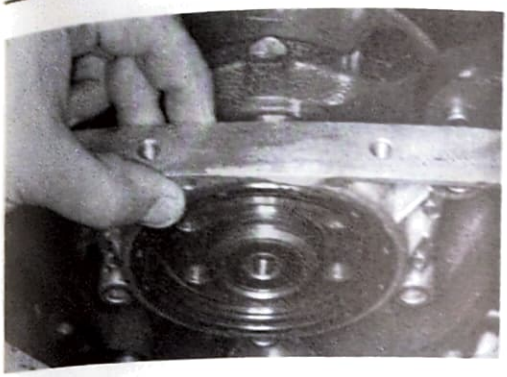
(b) Align the tab on the bearing shell with the groove in the cylinder block.

(c) Push the upper bearing shell into position.

If necessary, a punch may be used to push the shell into position.

(d) Check the main bearing oil clearance again.

If the clearance is still not within specification, the crankshaft must be removed and machined and undersized bearings installed.



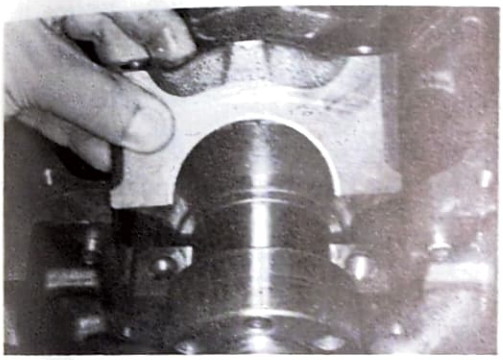
REMOVAL OF FLYWHEEL, REAR OIL SEAL AND CRANKSHAFT

1. REMOVE FLYWHEEL

Remove six bolts and the flywheel.

2. REMOVE REAR OIL SEAL RETAINER

Remove five bolts, rear oil seal retainer and gasket.

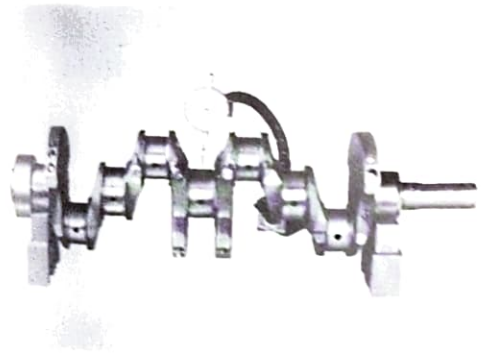


3. REMOVE CRANKSHAFT

(a) If the main bearing caps have not been removed, remove the caps.

(b) Lift out the crankshaft.

(c) Remove the upper main bearings from the cylinder block.



INSPECTION AND REPAIR OF CRANKSHAFT

1. MEASURE CRANKSHAFT

(a) Place the crankshaft on V-blocks.

(b) Using a runout gauge, measure the runout at the center journal.

If the runout is greater than the maximum, replace the crankshaft.

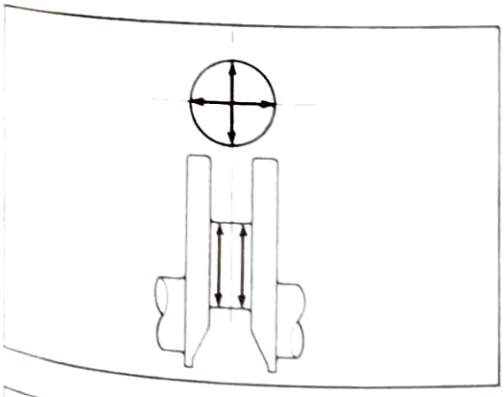
Runout maximum: 0.1 mm (0.004 in.)

(c) Using a micrometer, check the diameter of the main and crank pin journal.

Measure the journals for out-of-round and taper as shown.

If journals are worn, regrind or replace the crankshaft.

Main journal diameter:	**59.98 – 60.00 mm (2.3614 – 2.3622 in.)**
Crank pin diameter:	**52.99 – 53.00 mm (2.0862 – 2.0866 in.)**
Taper and out-of-round limit:	**0.01 mm (0.0004 in.)**

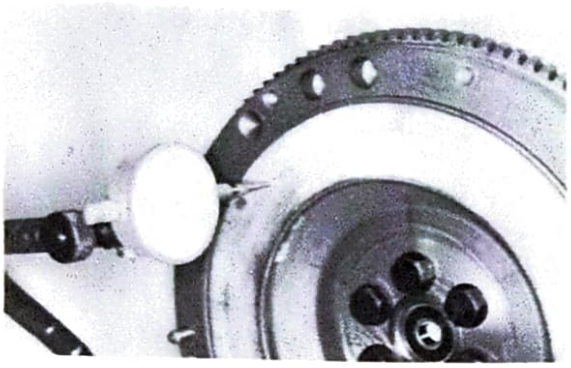


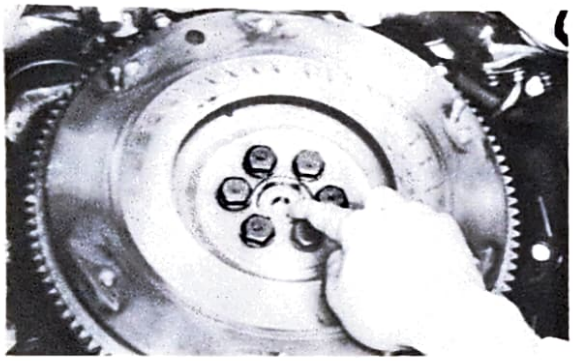
Bearing size	Crank pin finished diameter – mm (in.)
U/S 0.25	52.70 – 52.71 (2.0748 – 2.0752)

Bearing size	Main finished diameter – mm (in.)
U/S 0.25	59.70 – 59.71 (2.3504 – 2.3508)

2. GRIND CRANK PIN AND/OR MAIN JOURNALS IF NECESSARY

Grind the crank pin and/or main journals to the undersized finished diameter. Install a new rod and/or main undersize bearings.





INSPECTION OF FLYWHEEL

1. INSPECT FLYWHEEL

(a) Inspect the ring gear.

If the ring gear is damaged, cracked or worn, replace the flywheel.

(b) Inspect the surface contacting the clutch.

If damaged or excessively worn, replace the flywheel.

(c) Using a runout gauge, measure the surface contacting the clutch.

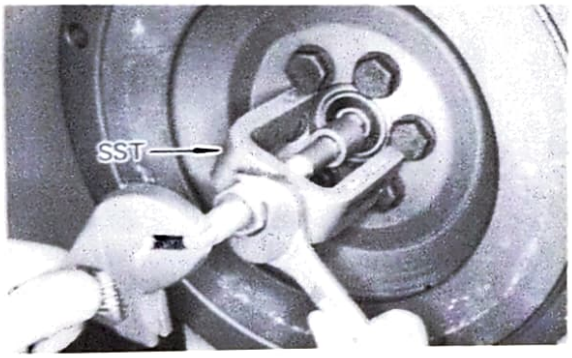
If runout is greater than the maximum, replace the flywheel.

Runout maximum: 0.2 mm (0.008 in.)

2. CHECK PILOT BEARING

Turn the bearing by hand while applying force in the rotating direction.

If the bearing sticks or has hard resistance, replace the pilot bearing.

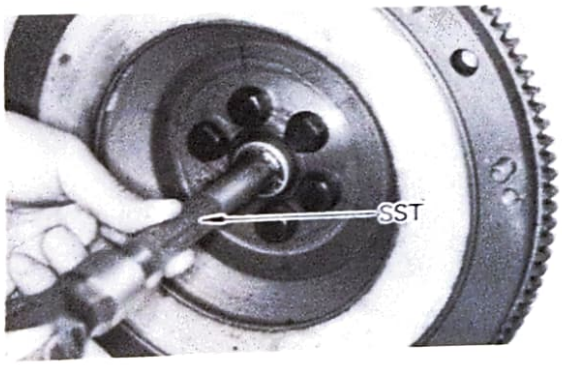


REPLACEMENT OF PILOT BEARING

1. REMOVE PILOT BEARING FROM FLYWHEEL

Using a puller*, remove pilot bearing.

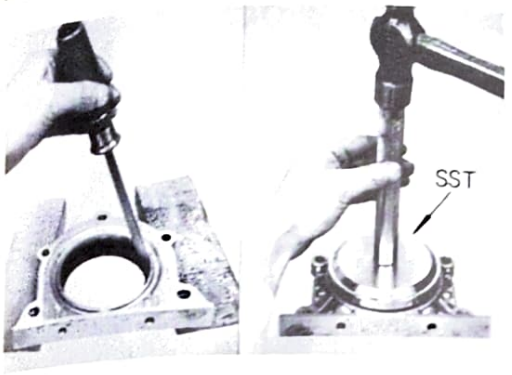
*SST 09303-35010



2. INSTALL PILOT BEARING IN FLYWHEEL

Using a driver*, install the pilot bearing.

*SST 09304-30012 or Commercial driver



INSPECTION AND REPLACEMENT OF REAR OIL SEAL

INSPECT REAR OIL SEAL

If the lip of the oil seal is worn, damaged or cracked, replace the seal as follows:

(a) Using a screwdriver, remove the oil seal.

(b) Using an oil seal driver*, install a new oil seal.

*SST 09608-35013 or Commercial driver

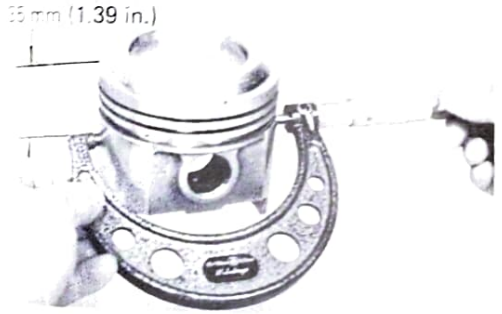
(c) Coat the seal lightly with multipurpose grease.

Size	Outside diameter mm (in.)
O/S 0.50	92.438 – 92.468 (3.6393 – 3.6405)
O/S 1.00	92.938 – 92.968 (3.6590 – 3.6602)

BORING OF CYLINDERS

1. SELECT OVERSIZED PISTON

O/S pistons with pins are available in the sizes listed. Replace pistons in matched sets. Take the largest bore measured and select the oversized piston for that bore. Bore all cylinders for the oversized piston selected.



2. CALCULATE DIMENSION TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter as shown.

(b) Calculate the size each cylinder is to be rebored as follows:

Size to be rebored = P + C – H

P = piston diameter

C = piston clearance

0.052 – 0.072 mm (0.0020 – 0.0028 in.)

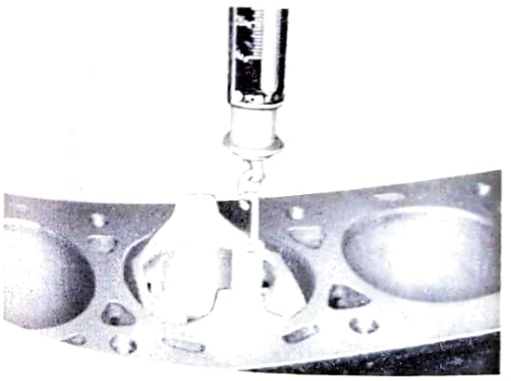
H = allowance for honing

Less than 0.02 mm (0.0008 in.)

3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Honing amount: 0.02 mm (0.0008 in.) maximum

CAUTION: Excess honing will destroy the finished roundness.



4. CHECK PISTON FIT IN CYLINDER

Insert a piston and 0.03 – 0.05 mm (0.0012 – 0.0020 in.) feeler gauge held by a tension gauge into the cylinder.

If the scale reading is correct, the clearance is correct.

Scale reading: 1.0 – 2.5 kg (2.2 – 5.5 lb)

CLEANING OF CYLINDER BLOCK

DEGLAZE AND CLEAN CYLINDERS

(a) If the crankshaft is installed, cover the crankshaft journals.

(b) Using a glaze breaker, remove the glaze from the cylinder bore.

(c) Clean the bore with soap and water. Dry thoroughly.

GENERAL ASSEMBLE NOTE:

Throughly clean all parts to be assembled. Before installing parts, apply new engine oil to all sliding and rotating surfaces.

INSTALLATION OF CRANKSHAFT, MAIN BEARINGS, REAR OIL SEAL AND FLYWHEEL

1. INSTALL UPPER MAIN BEARING IN CYLINDER BLOCK

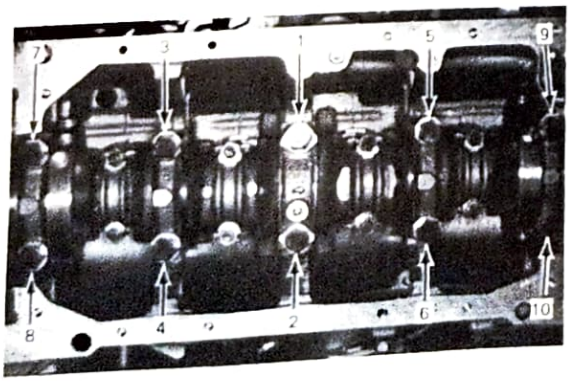
(a) Place the upper main bearing in the block.

(b) Install the upper thrust washers on the center main bearing with the oil grooves facing out.

(c) Lubricate the faces of the bearings with engine oil.

2. PLACE CRANKSHAFT IN CYLINDER BLOCK

3. INSTALL MAIN BEARING CAPS



NOTE: Each bearing cap is numbered.

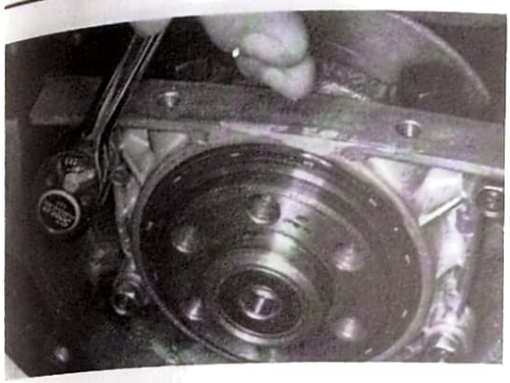
(a) Install thrust washers on bearing cap No. 3 with the oil grooves facing out.

(b) Install the bearing caps in numbered order with arrows facing forward. Tighten the bolts to the specified torque in the sequence shown in two or three passes.

Torque: 9.5 – 11.5 kg-m (69 – 83 ft-lb)

(c) Check that the crankshaft turns.

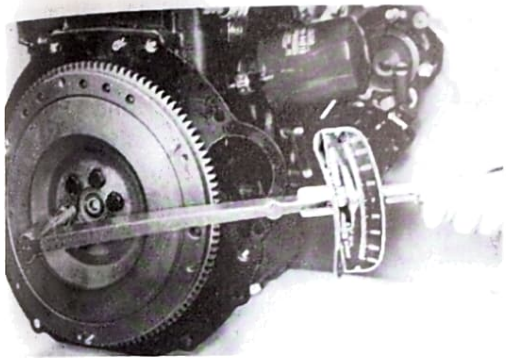
(d) Measure the crankshaft thrust. (See page 4-33)



4. INSTALL REAR OIL SEAL RETAINER

(a) Place the gasket on the cylinder block.

(b) Install the rear oil seal retainer over the crankshaft with five bolts.

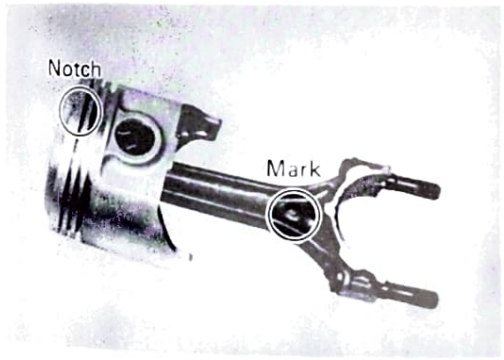


5. INSTALL FLYWHEEL

Install the flywheel on the crankshaft with six bolts. Torque the bolts.

Torque: 10.0 – 12.0 kg-m (73 – 86 ft-lb)

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY



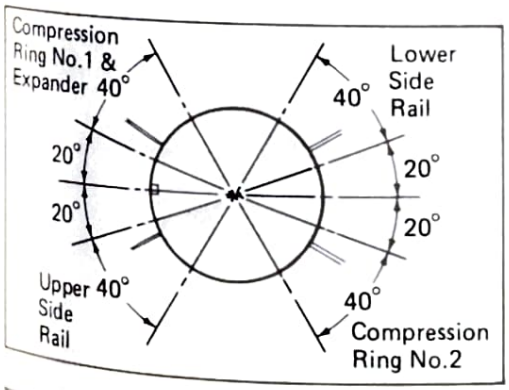
1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Install the new snap ring on one side of the piston pin hole.

(b) Heat the piston in hot water to about 80° C (176° F).

(c) Align the notch on the piston with the mark on the rod and push the piston pin in with your thumb.

(d) Install the new snap ring on the other side of the pin.



2. PLACE RINGS ON PISTON

(a) Using a ring expander, install the top two compression rings with the code marks facing up.

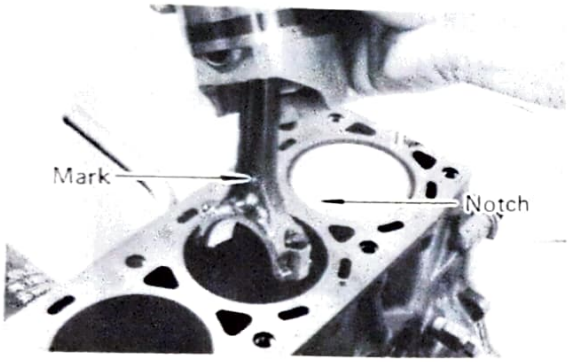
(b) Position the piston rings so that the ring end gaps are in the shaded area as shown.

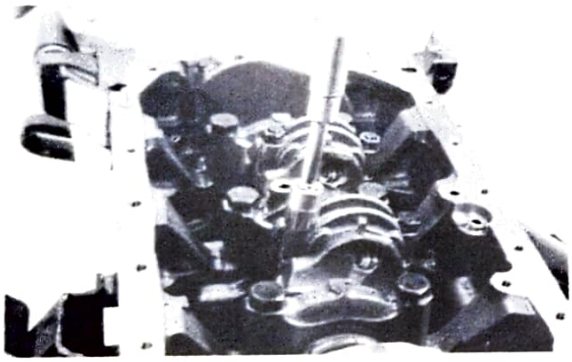
CAUTION: Do not align the end gaps.

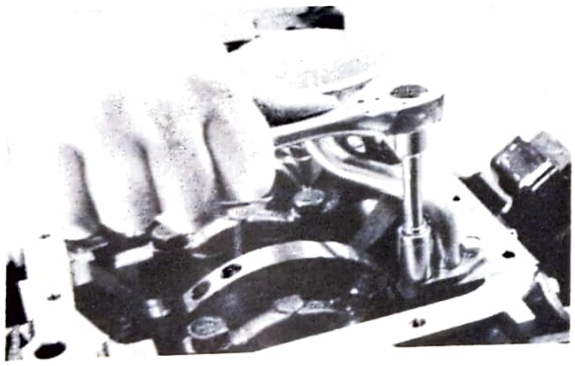
3. INSTALL BEARING INSERTS

(a) Install the bearing inserts in the connecting rods and rod caps.

(b) Lubricate the face of the bearings with engine oil.







INSTALLATION OF PISTON AND CONNECTING ROD ASSEMBLY

1. INSTALL PISTON AND CONNECTING ROD ASSEMBLY
   (a) Lubricate the cylinder bore and rod journals with clean engine oil.
   (b) Using a ring compressor, push the correctly numbered piston and rod assembly into each cylinder. Make sure the notch and mark are facing forward.

2. INSTALL ROD BEARING CAPS
   (a) Match the numbered cap with the numbered rod.
   (b) Align the marks punched on the rod and cap and tighten the cap nuts to specified torque alternately in two or three passes.

   Torque: 5.7 – 6.9 kg-m (42 – 49 ft-lb)

   NOTE: After tightening the caps, check that the crankshaft rotates smoothly.

3. MEASURE ROD THRUST CLEARANCE
   (See page 4-29)

4. INSTALL OIL STRAINER
   (a) Clean the oil strainer.
   (b) Place the oil screen gasket in place and install the oil strainer assembly with four bolts. Torque the bolts.

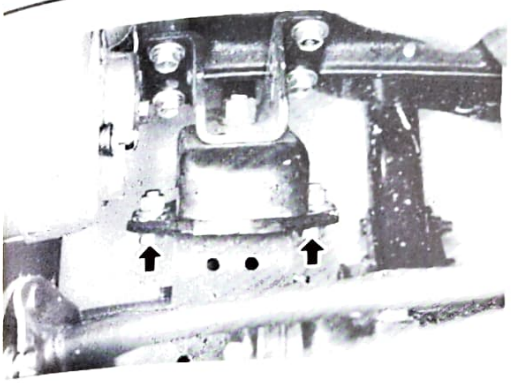
   Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

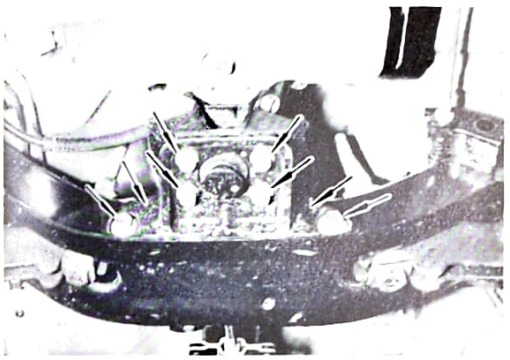
5. INSTALL OIL PAN (See page 4-24)

6. INSTALL TIMING CHAIN IF REMOVED
   (See page 4-24)

7. INSTALL CYLINDER HEAD (See page 4-15)

8. INSTALL ENGINE IF REMOVED (See page 4-41)



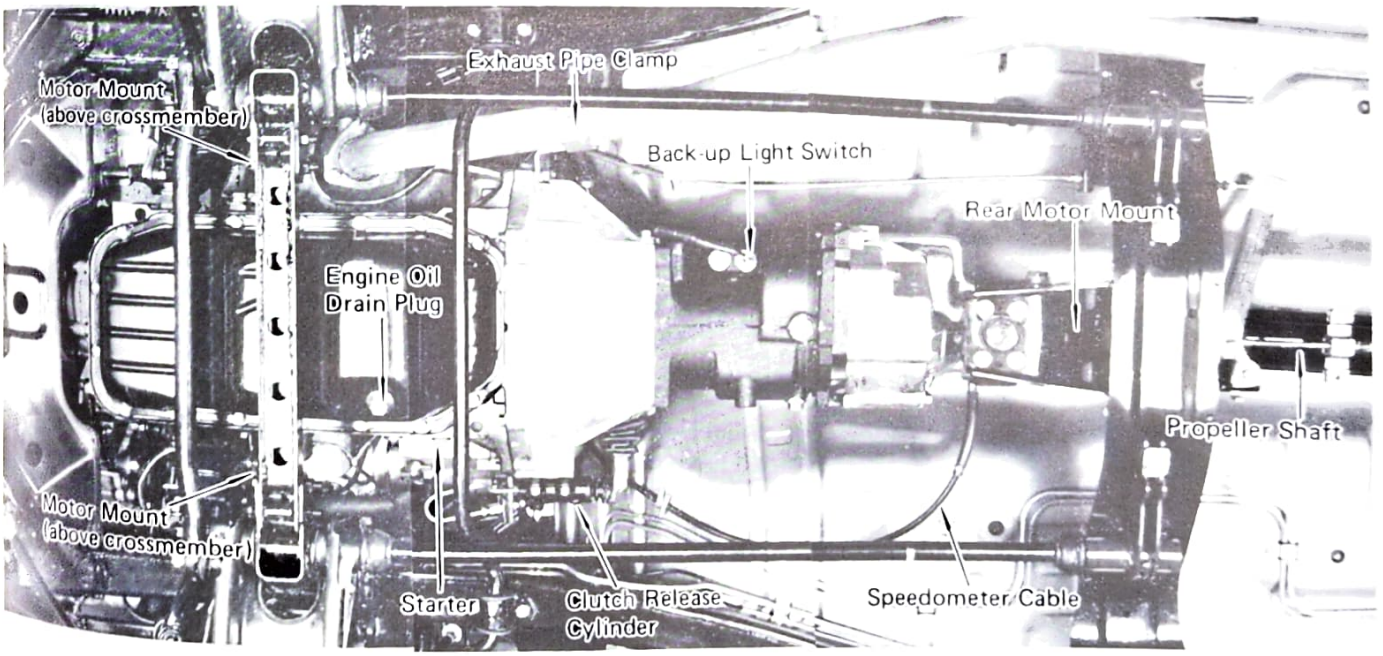


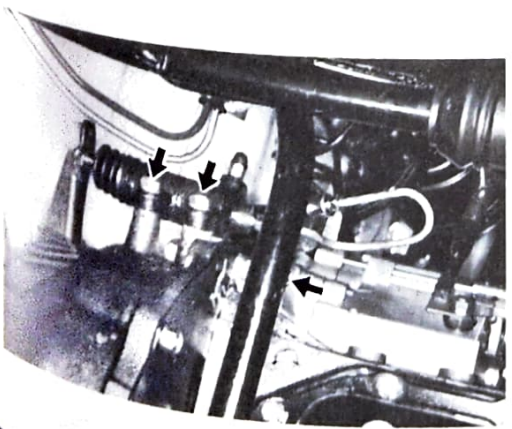
INSTALLATION OF ENGINE

1. CONNECT TRANSMISSION TO ENGINE
   (a) Install the transmission housing mount bolts.
   (b) Install the starter with the mount nut.
   (c) Install stiffener plate bolts.
2. INSTALL ENGINE WITH TRANSMISSION IN VEHICLE

   CAUTION: If vehicle has air conditioning, be carefull not to damage the condenser.

   (a) Attach the engine hoist chain to lift brackets on the engine.
   (b) Lower the engine into the engine compartment.
   (c) Align the engine with the motor mount supports and the rear motor support.
   (d) Install the motor mount bolts on each side of the engine.
   (e) Install the rear motor mount bolts on the rear motor mount support.
   (f) Remove the hoist chain.





3. INSTALL CLUTCH RELEASE CYLINDER FOR M/T

   Install the clutch release cylinder and hose bracket.

4. CONNECT EXHAUST PIPE MOUNT NUTS TO EXHAUST MANIFOLD

5. CONNECT EXHAUST PIPE CLAMP TO TRANSMISSION HOUSING

6. CONNECT SPEEDOMETER CABLE

7. INSTALL PROPELLER SHAFT (See page 12-8)

8. CONNECT SHIFT LINKAGE TO SHIFT LEVER FOR A/T

9. CONNECT FOLLOWING WIRES:
   (a) Starter wires
   (b) Bond cable to the right engine mounting bracket
   (c) Back-up light switch wire
   (d) Oil pressure sending unit wire
   (e) Oil pressure switch wire
   (f) Neutral start switch, back-up light switch and OD solenoid wires for A/T

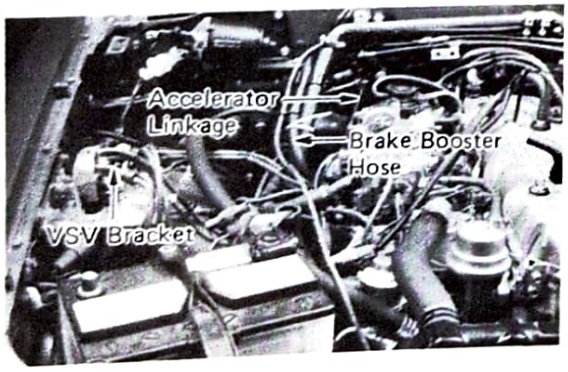
10. INSTALL TRANSMISSION SHIFT LEVER TO INSIDE OF VEHICLE FOR M/T
(See page 9-55)

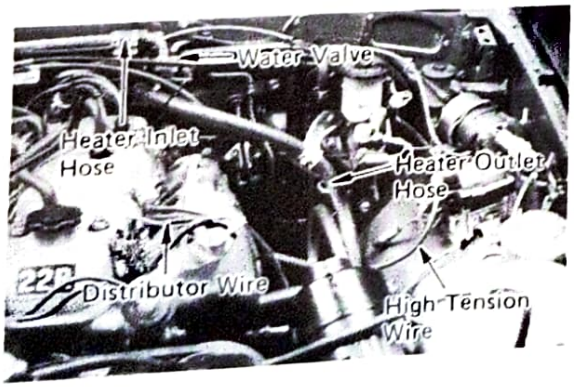
11. CONNECT ACCELERATOR LINKAGE TO CARBURETOR

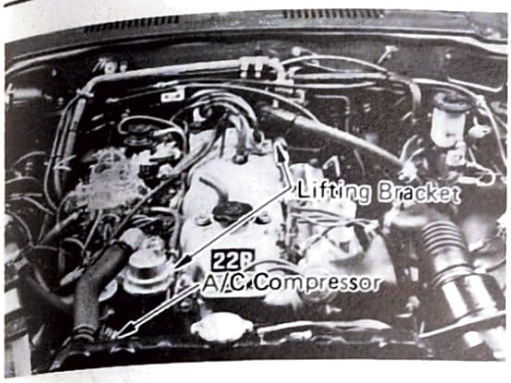
12. CONNECT THROTTLE CABLE TO CARBURETOR AND VALVE COVER FOR A/T

    INSTALL VSV BRACKET AND VACUUM HOSE BRACKET
    (a) Install the VSV bracket and vacuum hose bracket.
    (b) Connect the wires to the vacuum switch and VSVs.

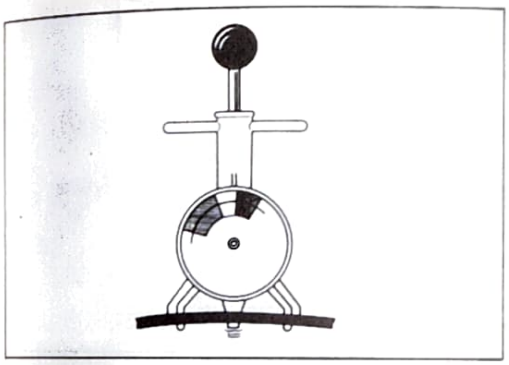
13. CONNECT FOLLOWING WIRES:
    (a) Thermo switch wire
    (b) Water temperature sending unit wire
    (c) Carburetor wires
    (d) Distributor wire
    (e) High tension wire to the ignition coil
    (f) Bond cable to the front and rear of the cylinder head
    (g) Alternator wires







14. CONNECT FOLLOWING HOSES:
   (a) Heater inlet hose to water valve
   (b) Brake booster hose to intake manifold
   (c) Two fuel hoses to the pipes under the intake manifold
   (d) Connect two emission control hoses to charcoal canister and outer vent control valve



15. INSTALL FAN, PULLEY AND DRIVE BELT

Adjust the belt.

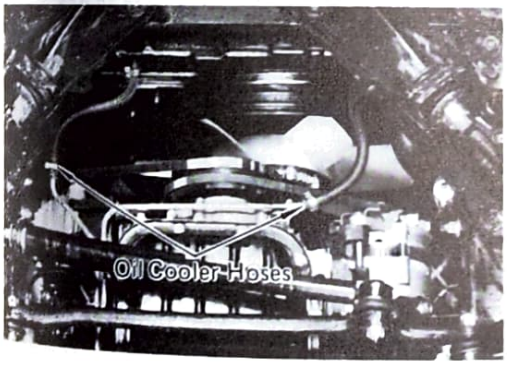
Drive belt tension:

New belt	125 ± 25 lb
Used belt	80 ± 20 lb

(W/ Borroughs belt tension gauge No. BT-33-73F)

16. IF VEHICLE HAS AIR CONDITIONING, INSTALL COMPRESSOR AND DRIVE BELT

Adjust the belt as shown above.



17. INSTALL RADIATOR, SHROUD AND RADIATOR HOSES (See page 6-6)

When installing the radiator, connect the heater outlet hose and oil cooler hoses for A/T to the radiator.

18. INSTALL AIR CLEANER

19. INSTALL BATTERY

20. INSTALL AND ADJUST HOOD (See page 18-2)

21. ADD COOLANT TO RADIATOR

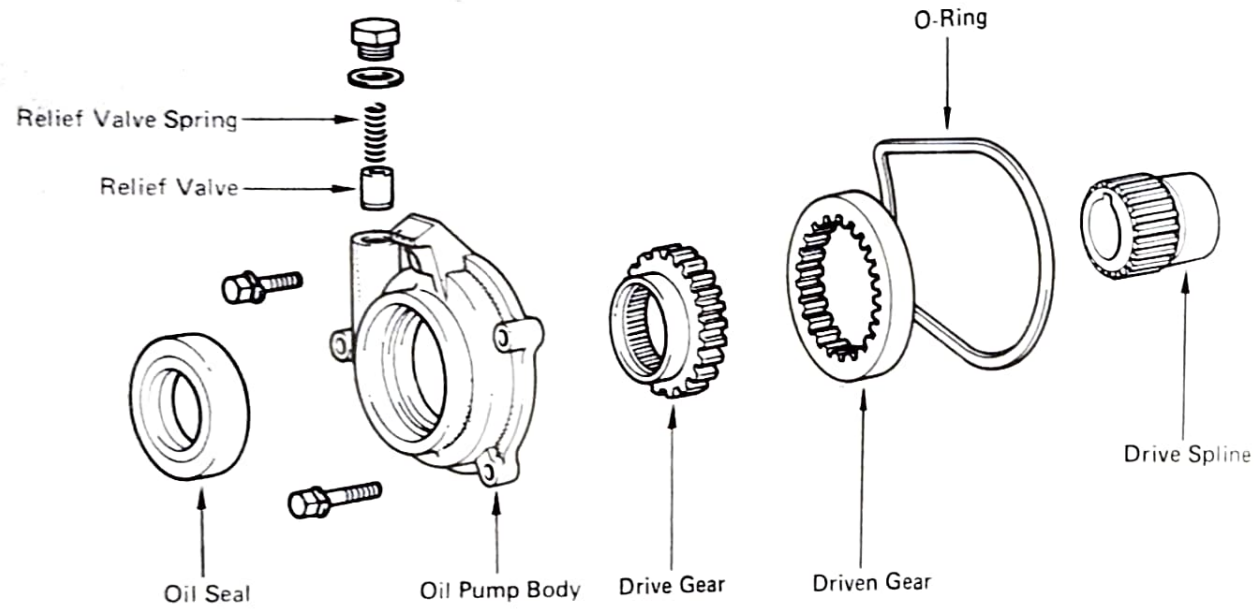
Close engine and radiator drain cocks. Fill radiator with approved coolant mixed to specifications.

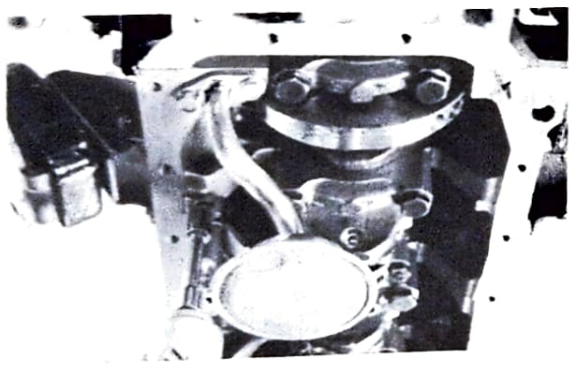
22. ENGINE OIL

Add four quarts of grade SE or better oil. Refer to the owner's manual to select the correct weight of oil.

23. START ENGINE
   (a) Check for leaks.
   (b) Perform engine adjustments as necessary.
   (c) Perform road test of the vehicle.
   (d) Recheck the coolant level.

OIL PUMP

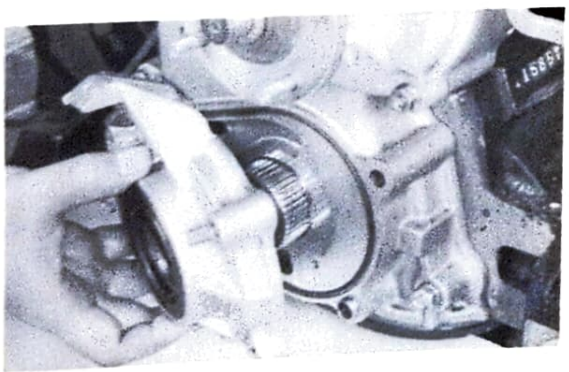




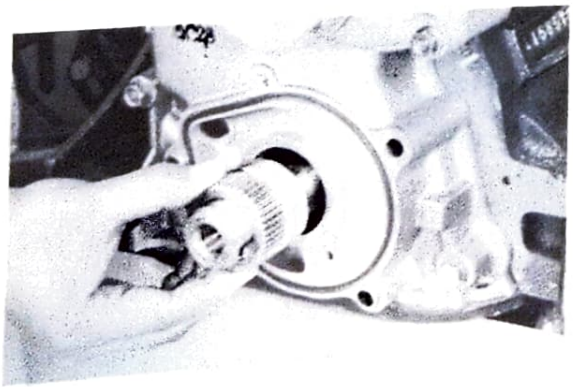
REMOVAL AND DISASSEMBLY OIL PUMP

NOTE: When repairing the oil pump, the oil pan and screen should be removed and cleaned.

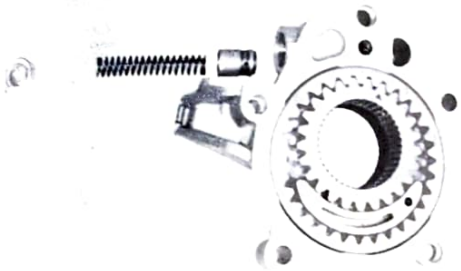
1. REMOVE OIL PAN **(See step 3, page 4-19)**
2. REMOVE OIL SCREEN
   Remove four bolts holding the oil pick-up screen.



3. REMOVE DRIVE BELTS AND CRANKSHAFT PULLEY **(See step 4 and 7, page 4-20)**
4. REMOVE OIL PUMP ASSEMBLY
   Remove five bolts and the oil pump assembly.



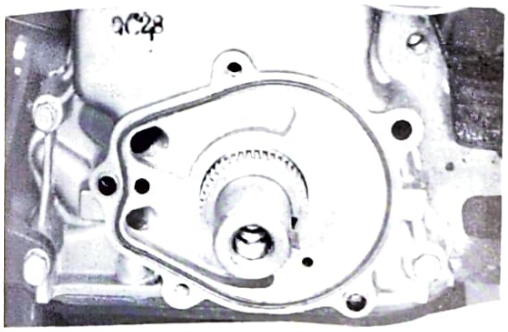
5. REMOVE OIL PUMP DRIVE SPLINE AND O-RING



6. DISASSEMBLE OIL PUMP ASSEMBLY

(a) Unscrew the relief valve plug, and remove spring and the relief valve piston.

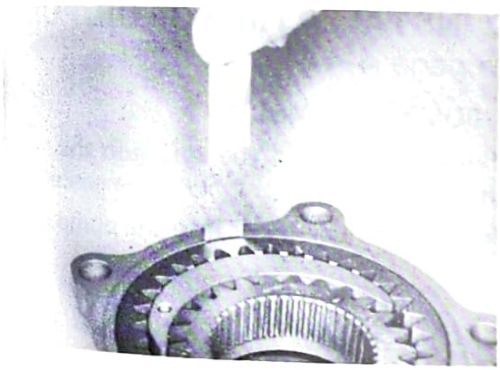
(b) Remove the drive, and driven gears.



INSPECTION OF OIL PUMP

1. INSPECT FOLLOWING COMPONENTS FOR WEAR OR DAMAGE:

(a) Drive spline
(b) Drive gear, driven gear
(c) Pump body
(d) Timing chain cover

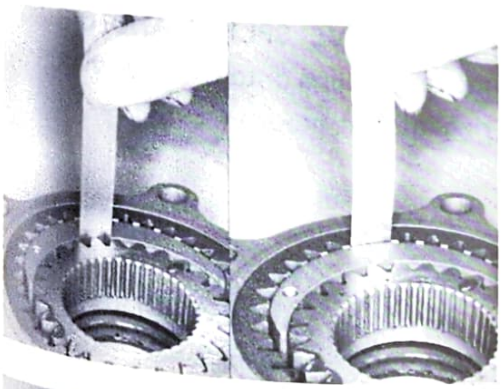


2. MEASURE BODY CLEARANCE

Using a feeler gauge, measure the clearance between the driven gear and body.

If the clearance is greater than the maximum, replace the gear and/or body.

Maximum clearance: 0.2 mm (0.008 in.)



3. MEASURE TIP CLEARANCE

Using a feeler gauge, measure the clearance between both gear tips and crescent.

If the clearance is greater than the maximum, replace the gears and/or body.

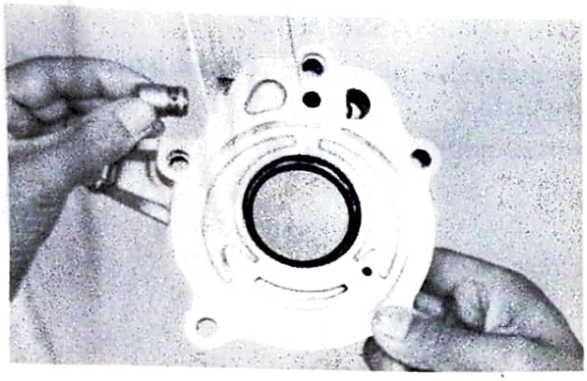
Maximum clearance: 0.3 mm (0.012 in.)

4. MEASURE SIDE CLEARANCE

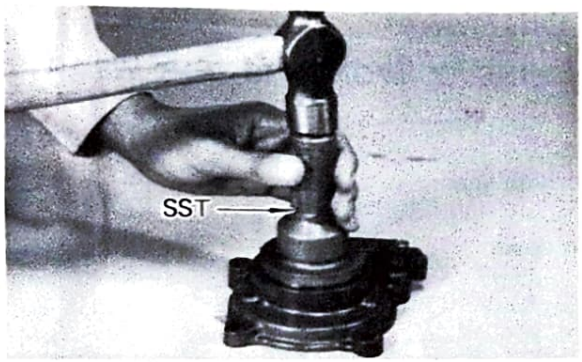
Using a feeler gauge and flat block, measure the side clearance as shown.

If the clearance is greater than the maximum, replace the gears and/or body.

Maximum clearance: 0.15 mm (0.0059 in.)

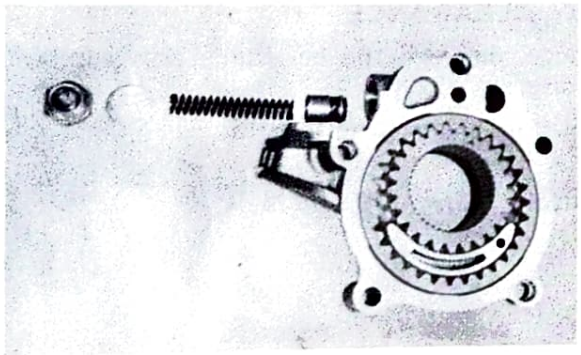


5. INSPECT FOLLOWING SURFACES FOR BURRS AND SCORING
   (a) Relief valve piston
   (b) Oil passages
   (c) Sliding surfaces

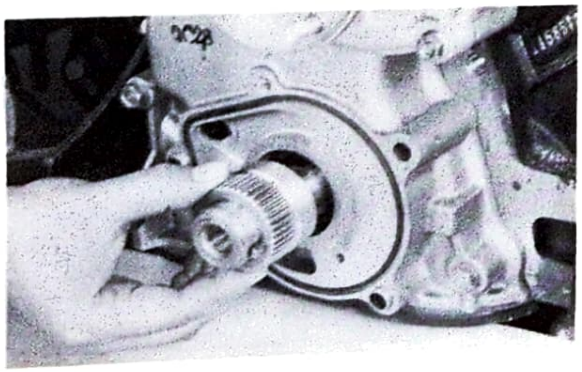


6. INSPECT FRONT OIL SEAL
   Check that the front oil seal is not worn, damaged or cracked. Replace the oil seal as follows, if necessary:
   (a) Using a small screwdriver, remove the seal.
   (b) Using a driver*, drive in the new seal.
   *SST 09223-50010 or Commercial driver

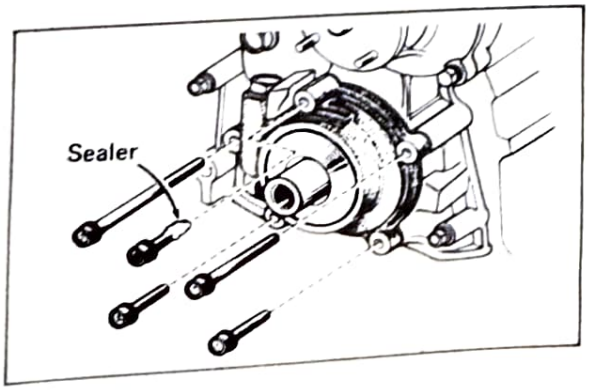
ASSEMBLY AND INSTALLATION OF OIL PUMP (See illustration on page 4-44)



1. ASSEMBLE OIL PUMP ASSEMBLY
   (a) Install relief valve piston and the spring in the body, and screw on the relief valve plug with the gasket.
   (b) Insert the drive and driven gears into the pump body.

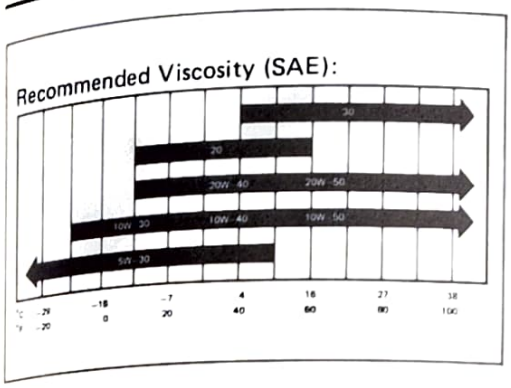


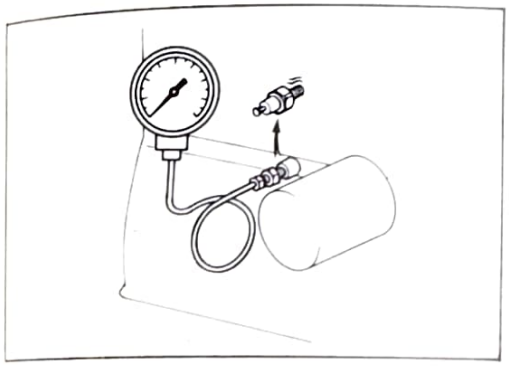
2. INSTALL OIL PUMP DRIVE SPLINE AND O-RING
   (a) Slide the pump drive spline onto the crankshaft.
   (b) Place the O-ring into the groove.



3. INSTALL OIL PUMP
   Apply the sealer to the upper bolt and tighten five bolts.

4. INSTALL FOLLOWING ITEMS:
   (a) Clean oil screen with four bolts
   (b) Clean oil pan and new gasket (See step 10, page 4-24)
   (c) Crankshaft pulley (See step 5, page 4-23)
   (d) Drive belts (See page 4-43)





OIL PRESSURE CHECK

1. CHECK OIL QUALITY

   Check the oil for deterioration, entry of water, discoloring or thinning.
   If oil quality is poor, replace.
   Use API SE grade or better and recommended viscosity oil.

2. CHECK OIL LEVEL

   The oil level should be between the L and F marks on the level gauge. If low, check for leakage and add oil up to the F mark.

3. REMOVE OIL PRESSURE SWITCH

4. INSTALL OIL PRESSURE GAUGE

5. START ENGINE

   Start engine and warm it up.

6. MEASURE OIL PRESSURE

   Oil pressure:

At idle speed	More than 0.3 kg/cm² (4.3 psi)
At 3,000 rpm	2.5 – 5.0 kg/cm² (35.6 – 71.1 psi)

   CAUTION: Check for oil leakage after reinstalling oil pressure switch or sender gauge.

FUEL SYSTEM

	Page
PRECAUTIONS	5-2
TROUBLESHOOTING	5-2
FUEL PUMP	5-2
FUEL TANK	5-5

PRECAUTIONS

1. Before working on the fuel system, disconnect the negative cable from the battery.
2. When working on the fuel system, do not smoke or work near any fire hazard.
3. Keep gasoline off rubber or leather parts.

TROUBLESHOOTING

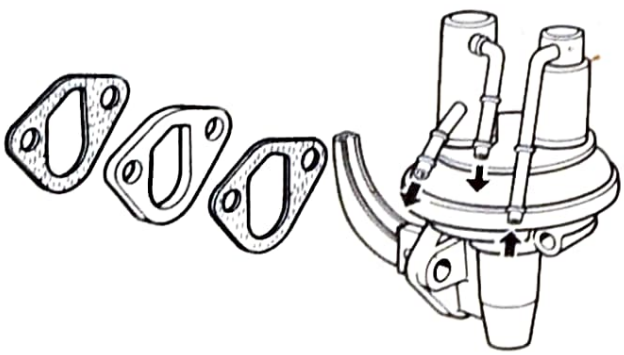
Problem	Possible cause	Remedy	Page
Insufficient fuel supply to carburetor	Fuel filter clogged	Replace fuel filter	2-20
	Fuel pump faulty	Replace fuel pump	5-3
	Fuel line clogged	Check fuel line	2-22
	Fuel line bent or kinked	Replace fuel line	

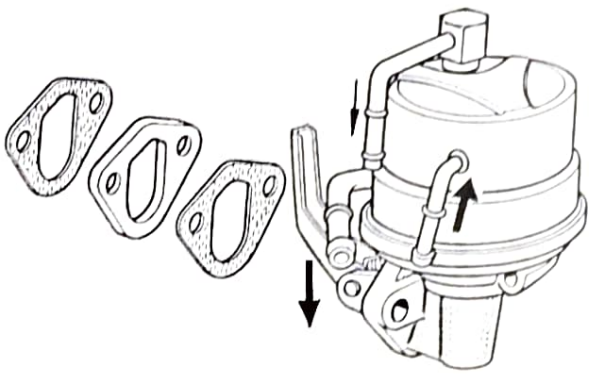
FUEL PUMP

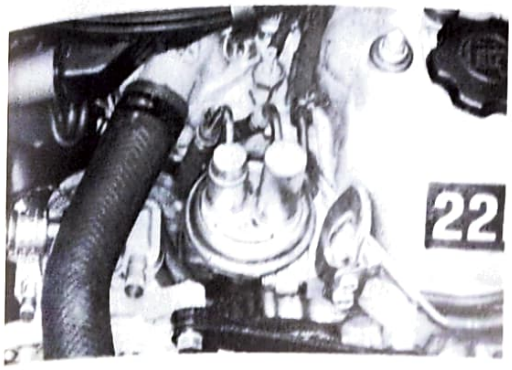
TYPE I

TYPE II

2 2R ENGINE







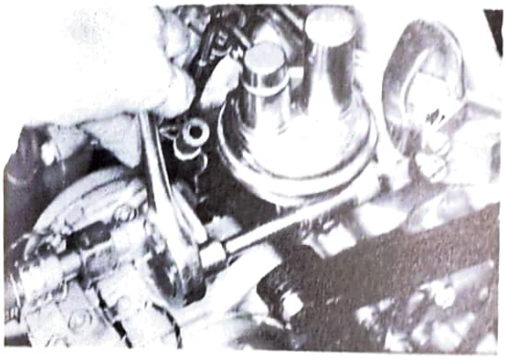
REMOVAL OF FUEL PUMP

1. DRAIN RADIATOR

   Open the radiator drain cock and allow coolant to drain into a suitable container.

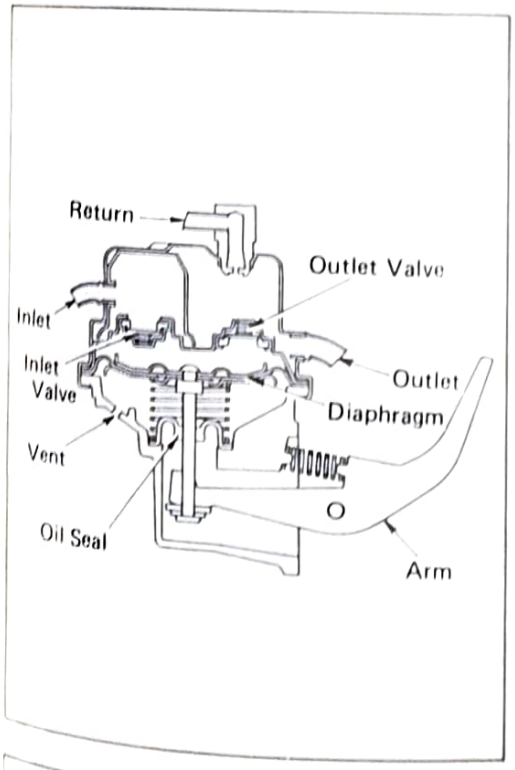
2. DISCONNECT UPPER RADIATOR HOSE

3. DISCONNECT THREE FUEL HOSES FROM FUEL PUMP



4. REMOVE FUEL PUMP

   Remove two bolts, fuel pump and gasket.



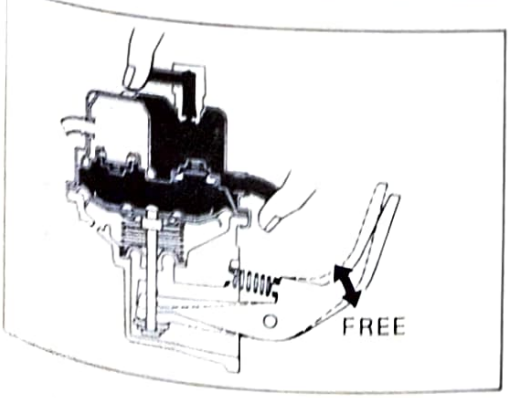
INSPECTION OF FUEL PUMP (Airtight Test)

PRECHECKS

Before performing the following checks on the fuel pump.

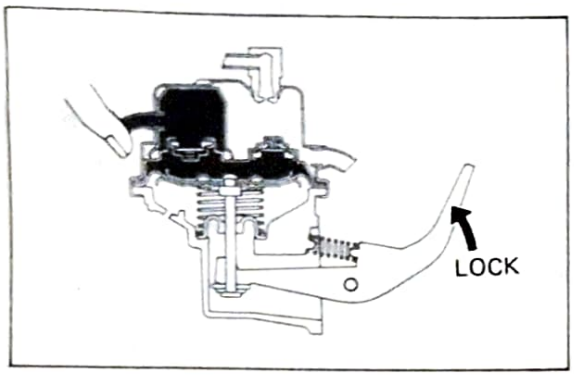
(1) Run some fuel through the pump to insure that the check valves seal tightenly (a dry check valve may not seal properly).

(2) Without blocking off any pipes, operate the pump lever and check the amount of force necessary for operation and the amount of arm play. This same amount of force should be used in the checks.



1. CHECK INLET VALVE

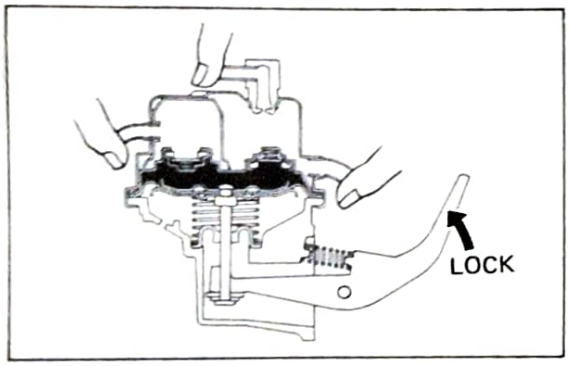
   Block off the outlet pipes with your finger and check that threre is an increase in lever arm play and that the lever arm moves freely (lost motion – no reaction force).



2. CHECK OUTLET VALVE

Block off the inlet pipe with your finger and check that the arm locks (does not operate with same amount of force used in the precheck above).

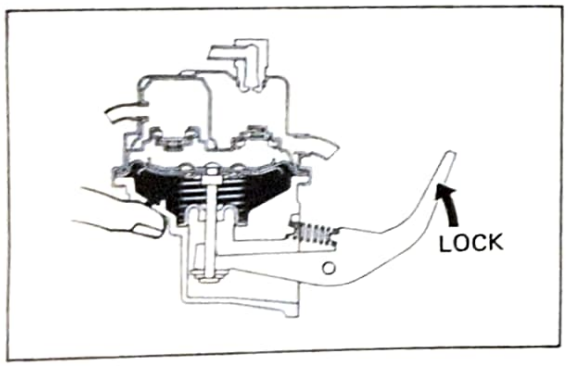
NOTE: Never use more force than that used in the pre-check. This applies to checks 3 and 4 also).



3. CHECK DIAPHRAGM

Block off the inlet and outlet pipes and check that the pump arm locks.

NOTE: If all three of these checks are not as specified, the caulking (sealing) of the body and upper casing is defective.

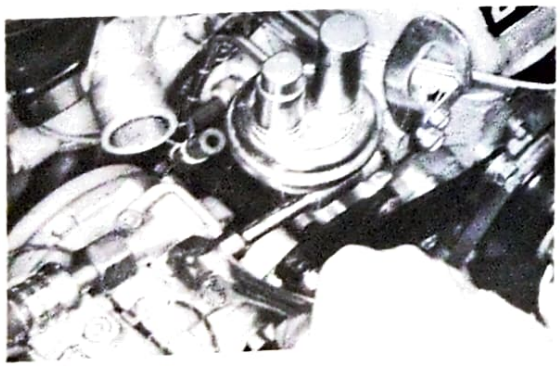


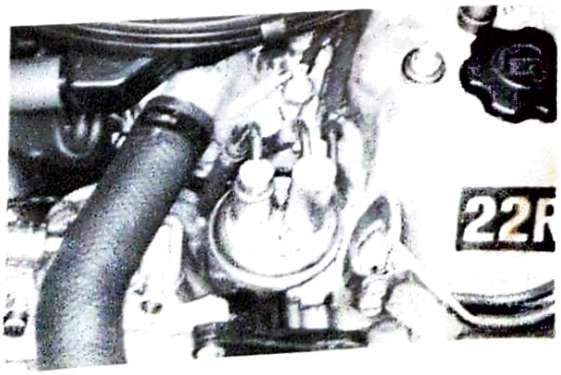
4. CHECK OIL SEAL

Block off the vent hole with your finger and check that the pump arm locks.

INSTALLATION OF FUEL PUMP

1. INSTALL FUEL PUMP WITH NEW GASKET
2. INSTALL TWO BOLTS

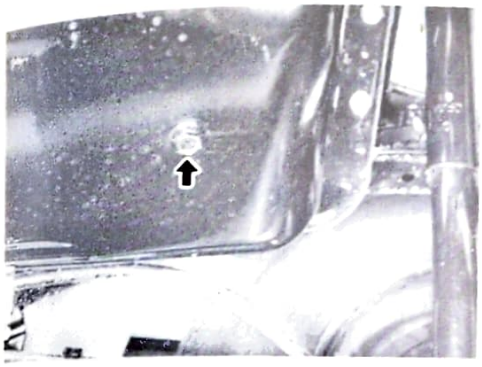




3. CONNECT THREE FUEL HOSES TO FUEL PUMP
4. CONNECT UPPER RADIATOR HOSE
5. FILL RADIATOR

Close the radiator drain cock and fill with a good brand of ethylene-glycol coolant.

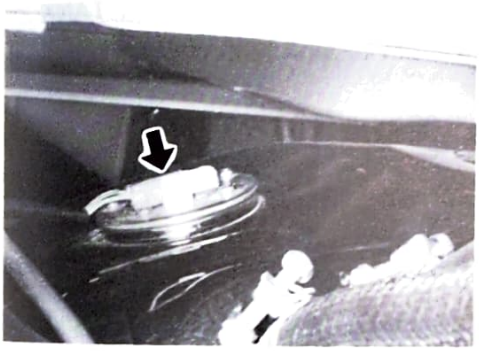
6. START ENGINE AND CHECK FOR LEAKS



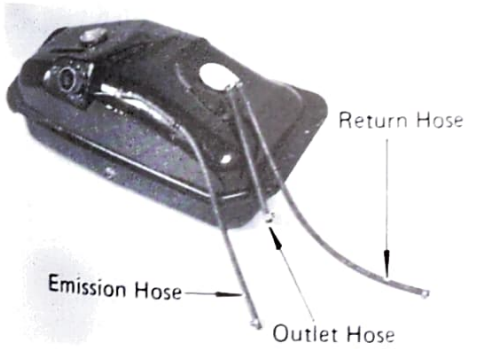
FUEL TANK

REMOVAL OF FUEL TANK

1. REMOVE DRAIN PLUG AND DRAIN FUEL TANK INTO SUITABLE CONTAINER

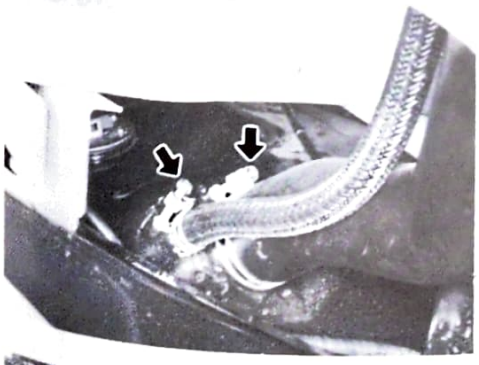


2. DISCONNECT CONNECTOR FROM FUEL SENDING UNIT

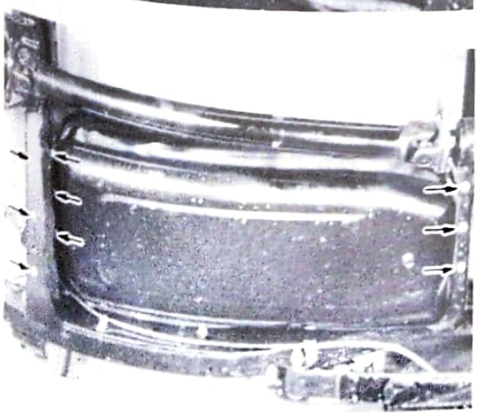


3. DISCONNECT THREE HOSES FROM FUEL PIPES

Plug the outlet hose to prevent gas from draining out of fuel tank.



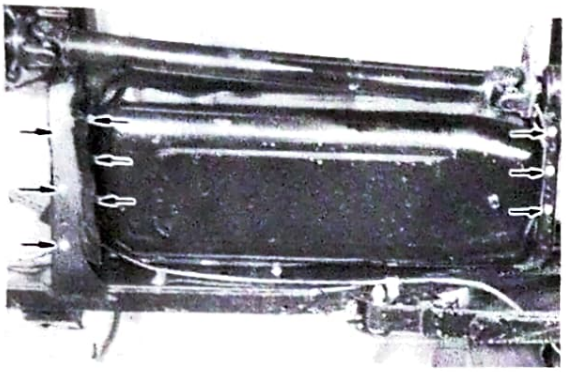
4. DISCONNECT TWO FILLER PIPES FROM FUEL TANK



5. REMOVE FUEL TANK

(a) Remove the fuel tank protector.

(b) Remove six bolts from fuel tank, and carefully lower fuel tank.



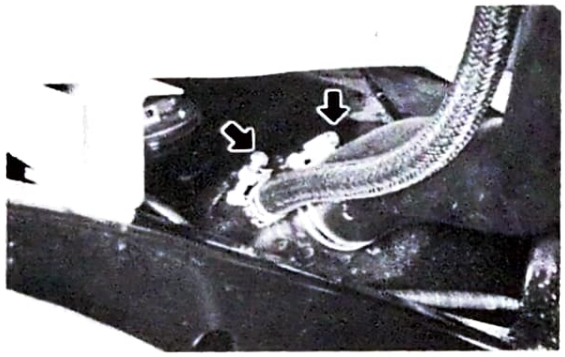
INSTALLATION OF FUEL TANK

1. INSTALL FUEL TANK

(a) Place fuel tank in installed position and secure with six bolts. Torque the bolts.

Torque: 1.5 – 2.2 kg-m (11 – 16 ft-lb)

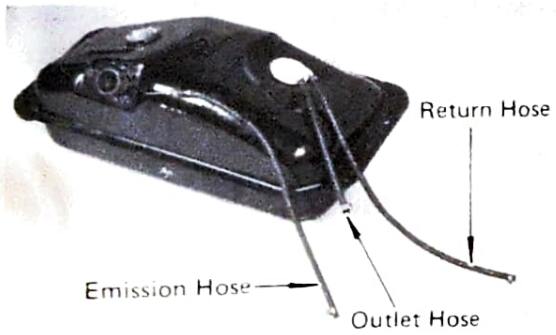
(b) Install the fuel tank protector with three bolts.



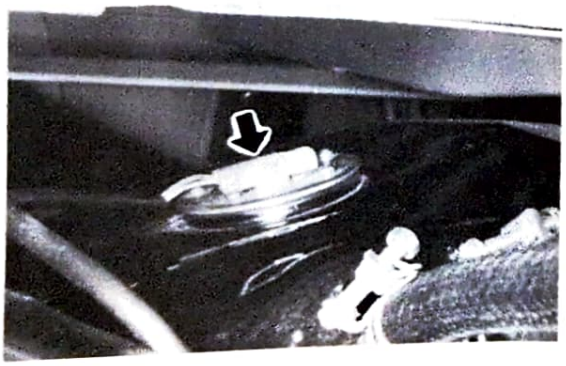
2. CONNECT TWO FILLER PIPES TO FUEL TANK

Connect two filler pipes to tank with clamps. Torque the clamps.

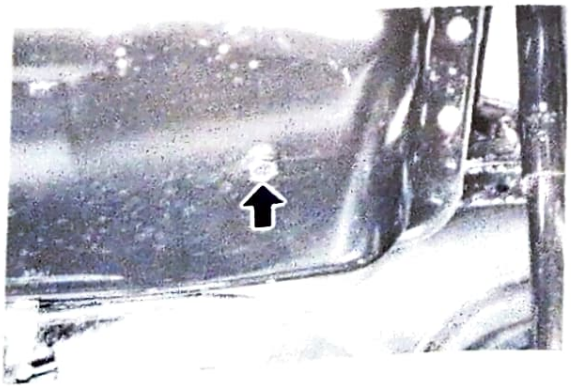
Torque: 0.15 – 0.25 kg-m (13.1 – 21.7 in.-lb)



3. CONNECT THREE HOSES TO FUEL TANK



4. CONNECT CONNECTOR TO FUEL SENDING UNIT



5. INSTALL DRAIN PLUG

Torque the plug.

Torque: 0.3 – 1.0 kg-m (26.1 – 86.8 in.-lb)

6. ADD GASOLINE, AND CHECK FOR LEAKS

COOLING SYSTEM

	Page
TROUBLESHOOTING	6-2
SPECIAL TOOLS AND TEST EQUIPMENT	6-2
WATER PUMP	6-3
THERMOSTAT	6-5
RADIATOR	6-5

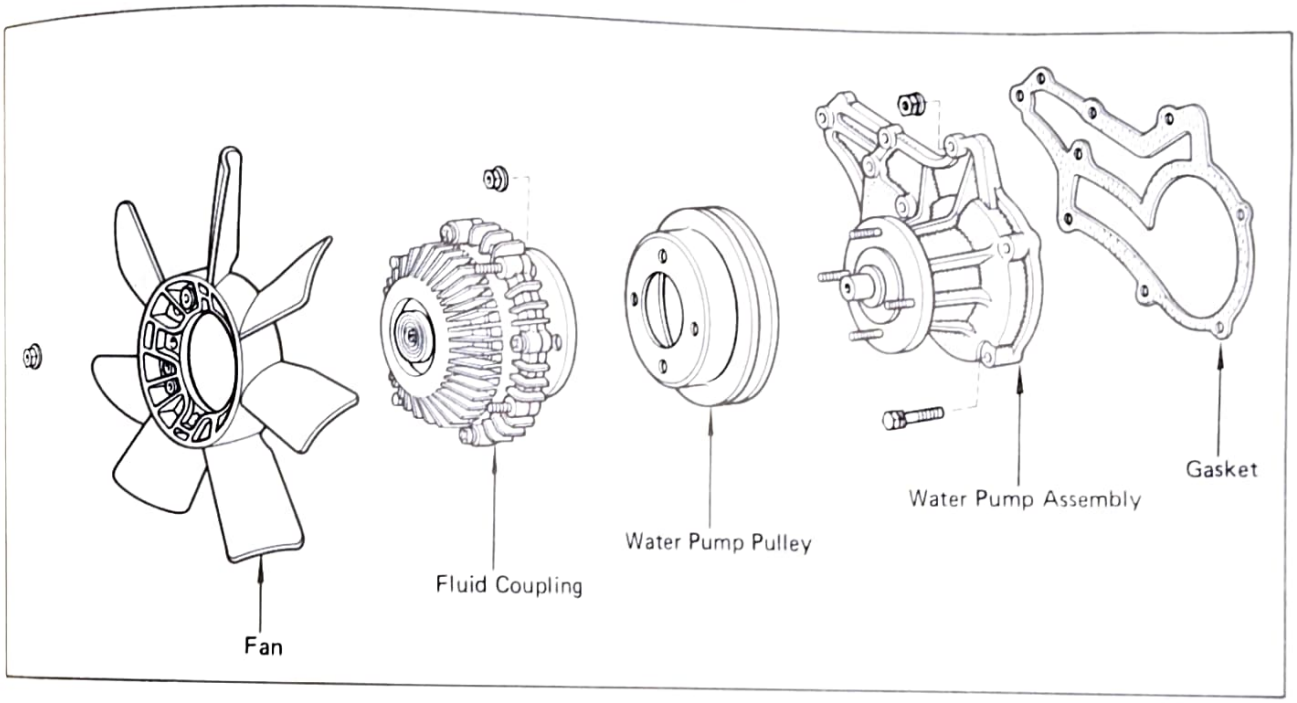
TROUBLESHOOTING

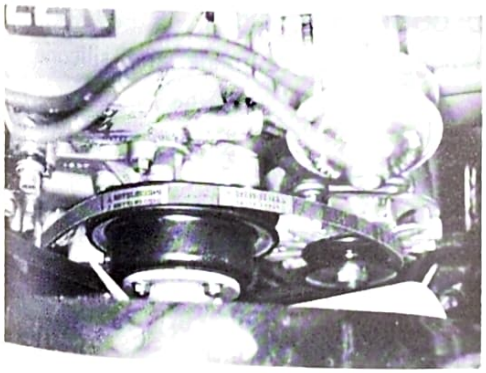
Problem	Possible cause	Remedy	Page
Engine overheats	Fan belt loose or missing	Adjust or replace belt	4-43
	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	
	Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	6-5
	Ignition timing retarded	Set timing	3-17
	Fluid coupling faulty	Replace fluid coupling	6-3
	Radiator hose plugged or rotted	Replace hose	
	Water pump faulty	Replace water pump	6-3
	Radiator plugged or cap faulty	Check radiator	6-5
	Cylinder head or block cracked or plugged	Repair as necessary	

SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Pressure tester	Commercial	To test cooling system

WATER PUMP





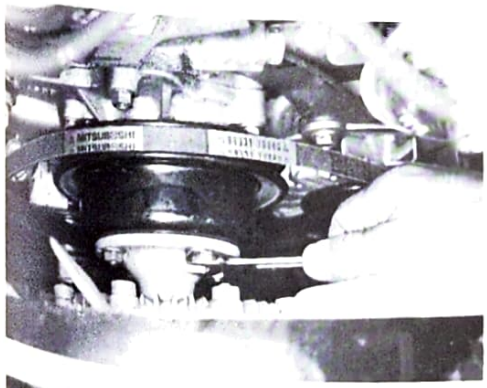
REMOVAL OF WATER PUMP

1. DRAIN RADIATOR

   Open radiator and engine drain cocks. Allow coolant to drain into a suitable container.

2. LOOSEN FAN BELT

   Loosen alternator pivot and adjusting bolts. Swing the alternator toward the engine.

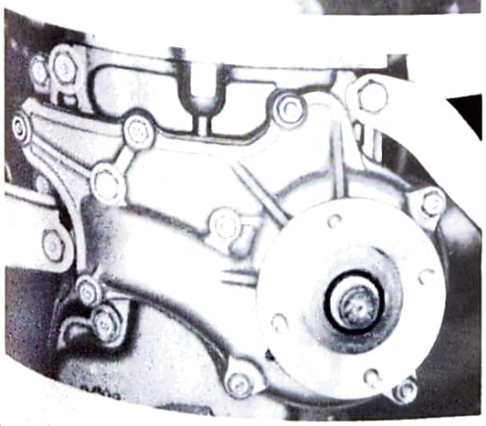


3. REMOVE FLUID COUPLING, FAN AND WATER PUMP PULLEY

   (a) Remove four nuts from the fluid coupling flange.

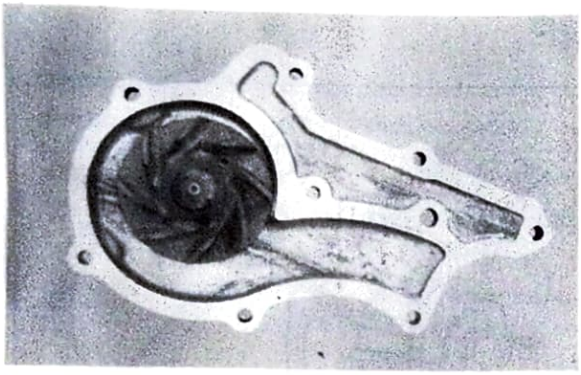
   (b) Remove the fluid coupling, water pump pulley and fan belt.

   (c) Remove the fan from the fluid coupling.



4. REMOVE WATER PUMP

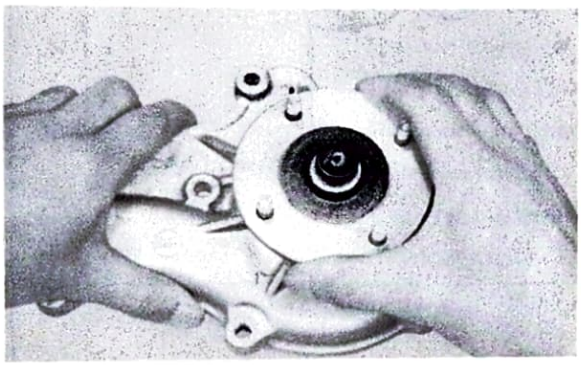
   Remove six bolts, three nuts, water pump and gasket.



INSPECTION OF WATER PUMP

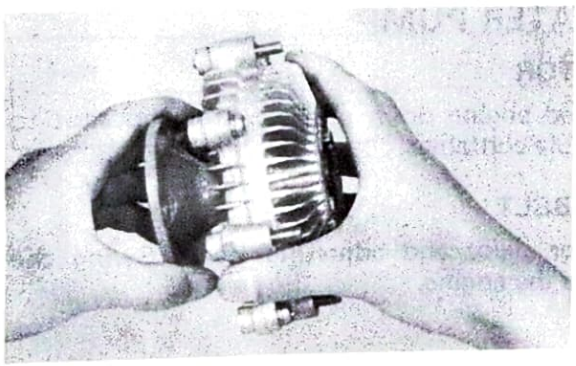
1. INSPECT WATER PUMP BODY AND TIMING CHAIN COVER

Check the water pump body and timing chain cover for cracks and damaged gasket surfaces. Replace as necessary.



2. INSPECT WATER PUMP BEARING

Check that water pump bearing operation is not rough or noisy.



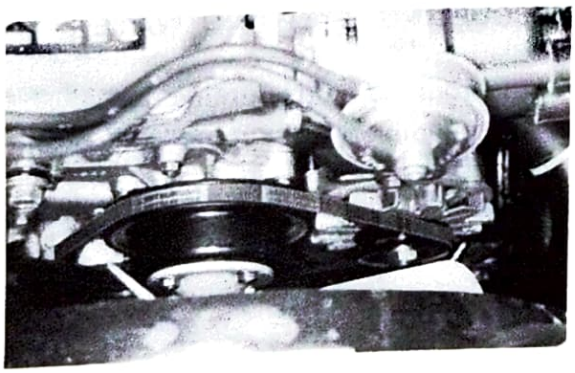
3. INSPECT FLUID COUPLING

Check the fluid coupling for damage and silicone oil leakage.

INSTALLATION OF WATER PUMP

1. INSTALL WATER PUMP OVER NEW GASKET

Install water pump on new gasket with six bolts and three nuts.



2. INSTALL FAN BELT AND PULLEY

(a) Check fan belt for cracks or damage.

(b) Place fan belt on pulley and place pulley on bolts of water pump.

3. INSTALL FAN ON FLUID COUPLING

4. INSTALL FLUID COUPLING

Install fluid coupling on pulley with four nuts.

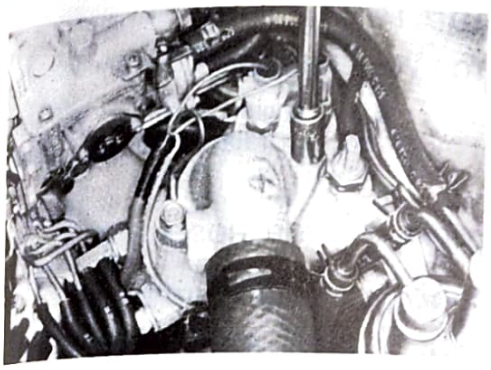
5. ADJUST FAN BELT TENSION (See page 4-43)

6. FILL RADIATOR

Close radiator and engine drain cocks. Fill with a good brand of ethylene-glycol coolant.

Total capacity: 8.4 liters (8.9 US qts, 7.4 Imp.qts)

7. START ENGINE AND CHECK FOR LEAKS



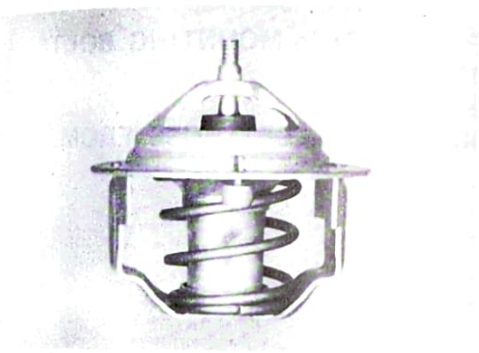
THERMOSTAT

REMOVAL OF THERMOSTAT

1. REMOVE WATER OUTLET

   Remove two bolts and water outlet from intake manifold.

2. REMOVE THERMOSTAT AND GASKET



INSPECTION OF THERMOSTAT

(a) Immerse the thermostat in water and heat it gradually.

(b) Check that the valve starts to open at 88°C (190°F) and opens more than 8 mm (0.31 in.) at 100°C (212°F).

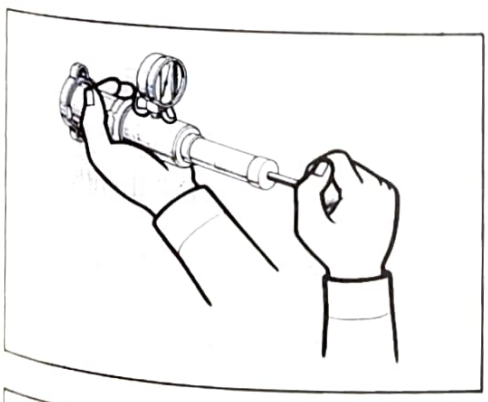
(c) Check that valve spring is tight when thermostat is fully closed.

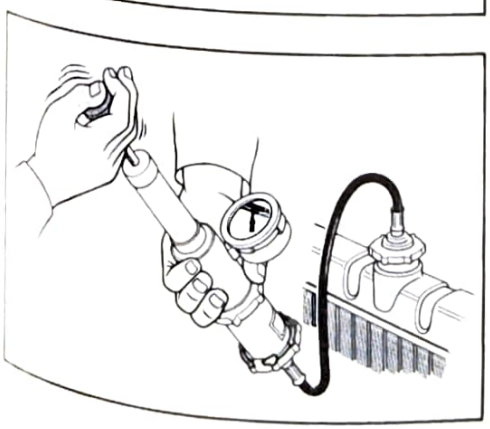
INSTALLATION OF THERMOSTAT

1. PLACE THERMOSTAT IN INTAKE MANIFOLD

2. INSTALL WATER OUTLET

   Install water outlet on new gasket with two bolts.





RADIATOR

INSPECTION OF RADIATOR

1. CHECK RADIATOR CAP

   Using pressure tester, pump tester until relief valve opens. Check that valve opens between 0.75 kg/cm² (10.7 psi) and 1.05 kg/cm² (14.9 psi).

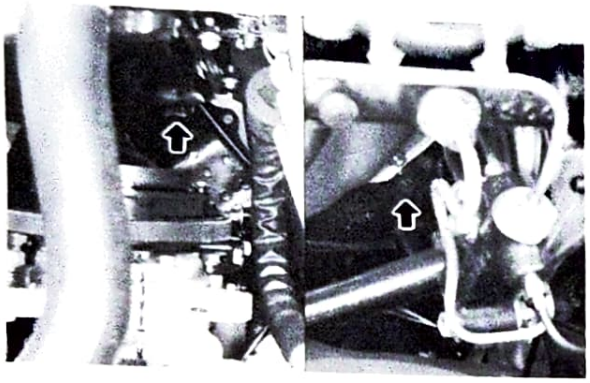
   Check that pressure gauge does not drop rapidly when pressure on cap is below 0.6 kg/cm² (8.5 psi).

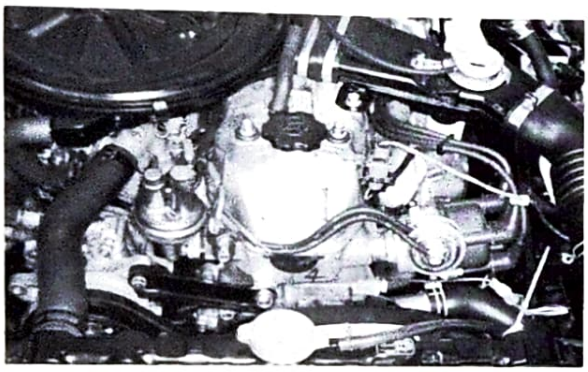
   If either check is not within limits, replace cap.

2. CHECK COOLING SYSTEM FOR LEAKS

   Attach pressure tester to the radiator and pump tester to 0.9 kg/cm² (12.8 psi). Check that pressure does not drop.

   If the pressure drops, check for leaks from hoses, radiator or water pump. If no external leaks are found, check heater core, block and intake manifold.





REMOVAL OF RADIATOR

1. DRAIN RADIATOR AND ENGINE

   Open radiator drain cock and engine drain cock (located on the left rear of engine block). Drain fluid into a suitable container.

2. DISCONNECT TWO RADIATOR HOSES

3. DISCONNECT COOLANT RESERVOIR TUBE

4. REMOVE FOUR SHROUD MOUNTING BOLTS

5. REMOVE FOUR RADIATOR MOUNTING BOLTS AND RADIATOR

6. DISCONNECT HEATER OUTLET HOSE FROM RADIATOR

INSTALLATION OF RADIATOR

1. CONNECT HEATER OUTLET HOSE TO RADIATOR

2. INSTALL RADIATOR

   Place radiator in installed position and install four mounting bolts.

3. INSTALL FOUR SHROUD MOUNTING BOLTS

4. CONNECT TWO RADIATOR HOSES

   Check hoses for cracks or damage.

5. CONNECT COOLANT RESERVOIR TUBE

6. FILL RADIATOR

   Close radiator and engine drain cocks. Fill with a good brand of ethylene-glycol coolant.

   Total capacity: 8.4 liters (8.9 US qts, 7.4 Imp. qts)

7. START ENGINE AND CHECK FOR LEAKS

STARTING SYSTEM

	Page
TROUBLESHOOTING	7-2
SPECIAL TOOLS AND TEST EQUIPMENT	7-2
STARTING SYSTEM CIRCUIT	7-2
REDUCTION TYPE STARTER	7-3

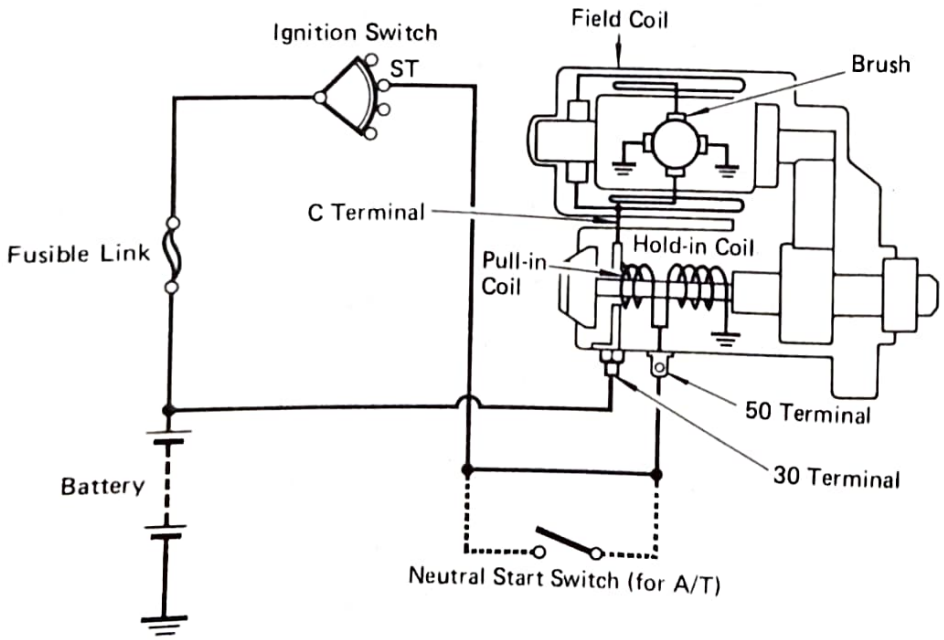
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity Charge or replace battery	8-4
	Battery cables loose, corroded or worn	Repair or replace cables	
	Neutral start switch faulty (auto. trans.)	Replace switch	
	Fusible link blown	Replace fusible link	
	Starter faulty	Repair starter	7-4
	Ignition switch faulty	Replace ignition switch	17-7
Engine cranks slowly	Battery charge low	Check battery specific gravity Charge or replace battery	8-4
	Battery cables loose, corroded or worn	Repair or replace cables	
	Starter faulty	Repair starter	7-4
Starter keeps running	Starter faulty	Repair starter	7-4
	Ignition switch faulty	Replace ignition switch	17-7
	Short in wiring	Repair wiring	
Starter spins — engine will not crank	Pinion gear teeth broken or faulty starter	Repair starter	7-4
	Flywheel teeth broken	Replace flywheel	

SPECIAL TOOLS AND TEST EQUIPMENT

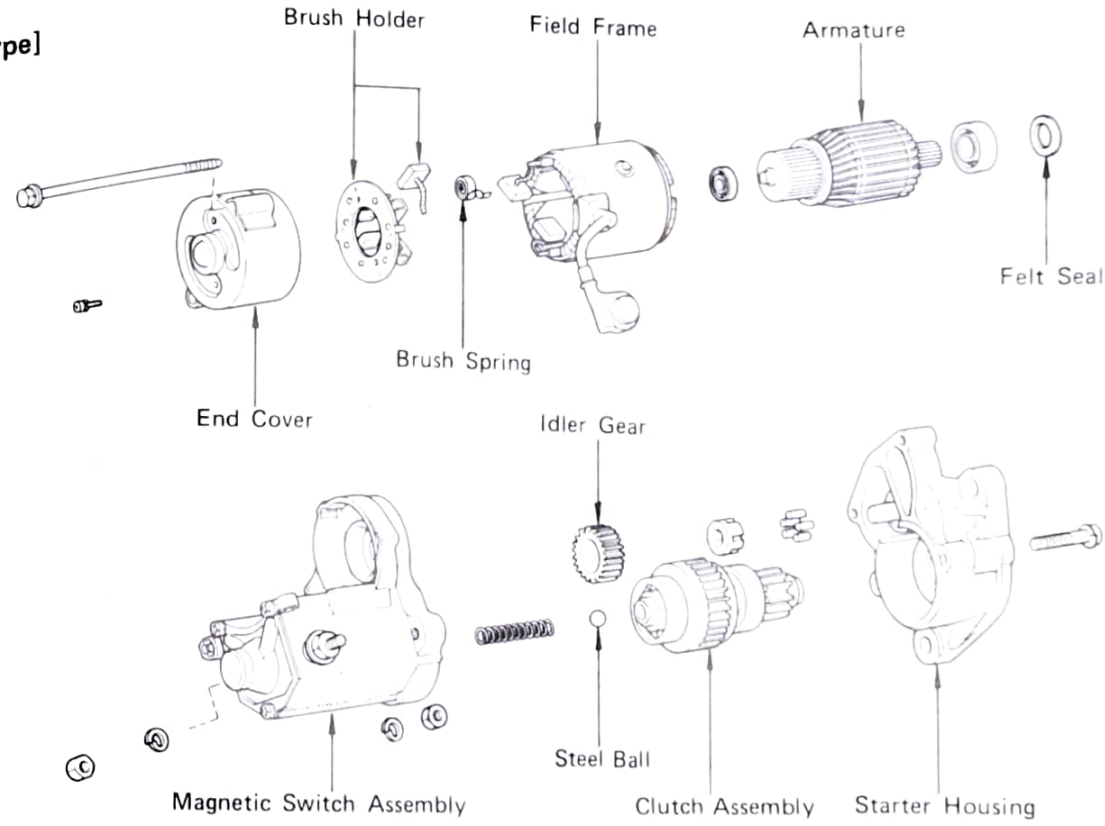
Tool	SST No.	Use
Voltmeter/ohmmeter/ammeter	Commercial	To check starter performance

STARTING SYSTEM CIRCUIT

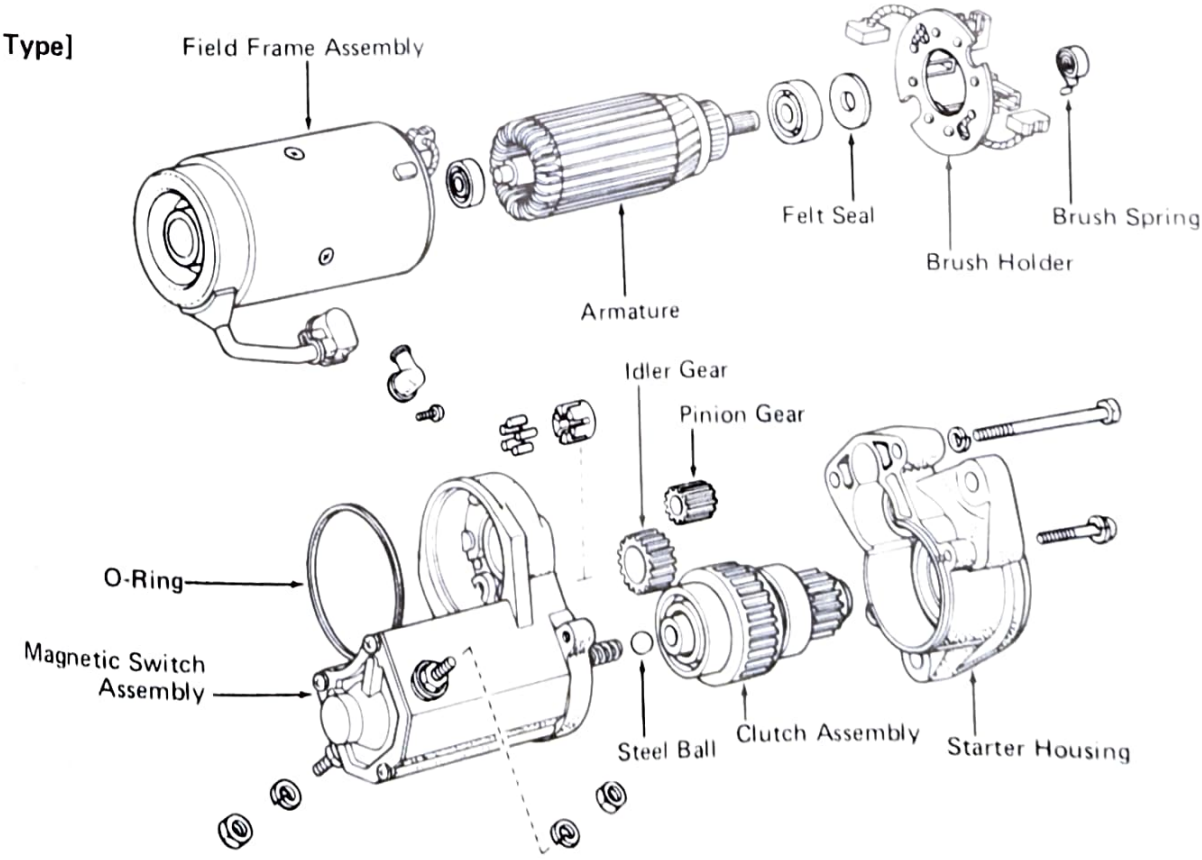


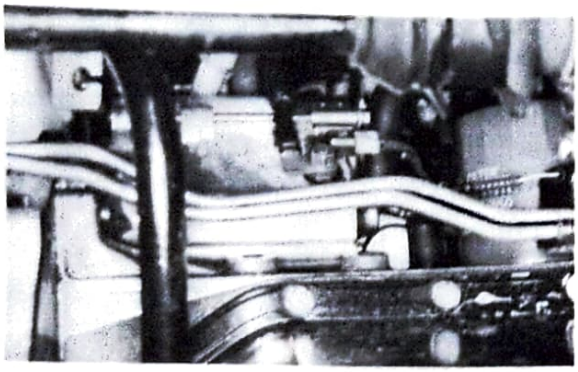
REDUCTION TYPE STARTER

[1.0 kw Type]



[1.4 kw Type]





REMOVAL OF REDUCTION TYPE STARTER

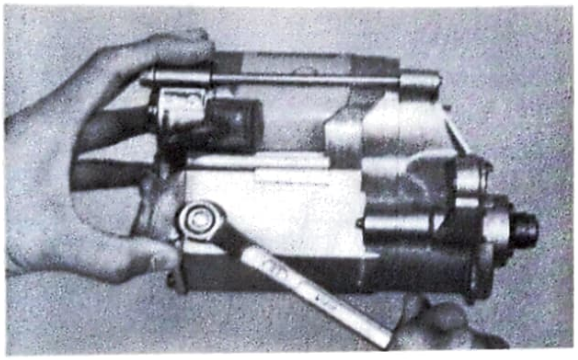
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT TWO WIRES FROM STARTER

Remove the nut and disconnect the battery cable from the magnetic switch on the starter motor. Disconnect the other wire from the terminal.

3. REMOVE STARTER MOTOR

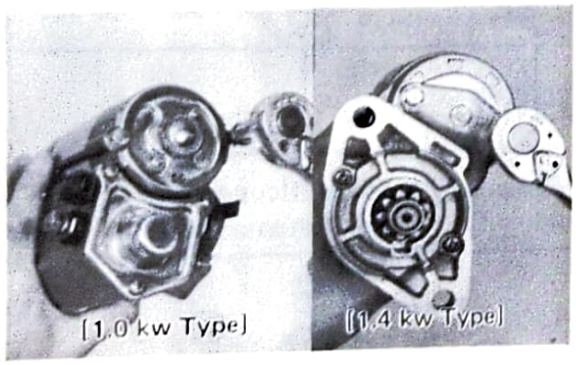
Remove the two bolts, and remove the starter motor from the flywheel bellhousing.



DIASSEMBLY OF REDUCTION TYPE STARTER

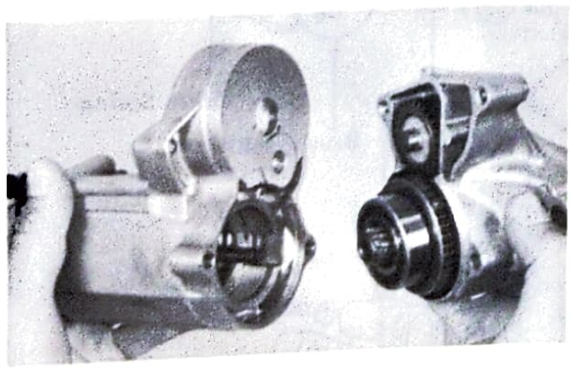
1. REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH

(a) Disconnect the lead wire from the magnetic switch terminal.



(b) Remove the two bolts. Pull out the field frame with armature from the magnetic switch.

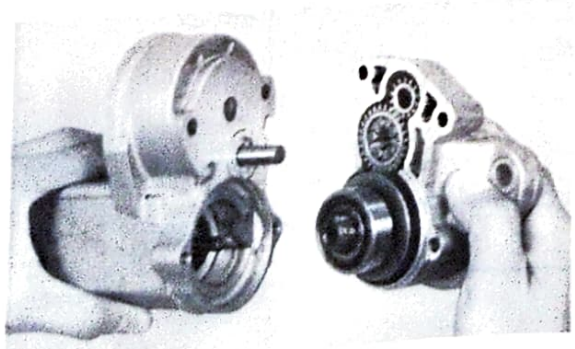
(c) Remove the felt seal and O-ring (1.4 kw type only).



2. REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY

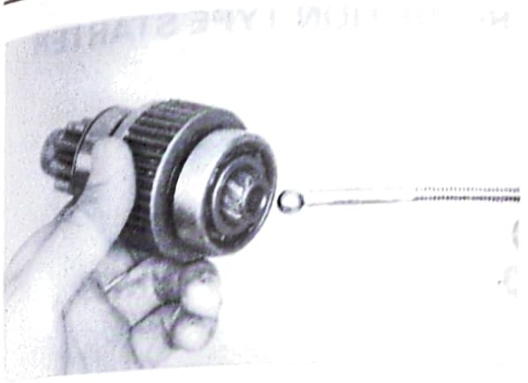
[1.0 kw type]

Remove the two screws and remove the starter housing with the idler gear and clutch.



[1.4 kw type]

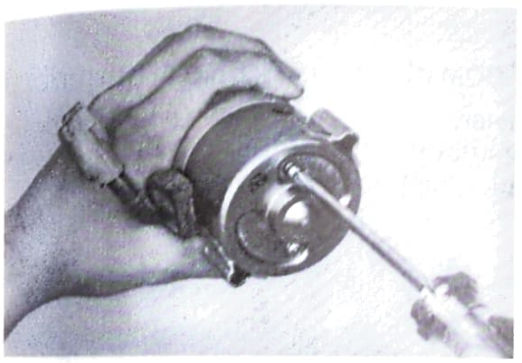
Remove the two screws and remove the starter housing with the pinion gear, idler gear and clutch.



3. REMOVE CLUTCH ASSEMBLY AND GEARS FROM MAGNETIC SWITCH ASSEMBLY

4. REMOVE STEEL BALL

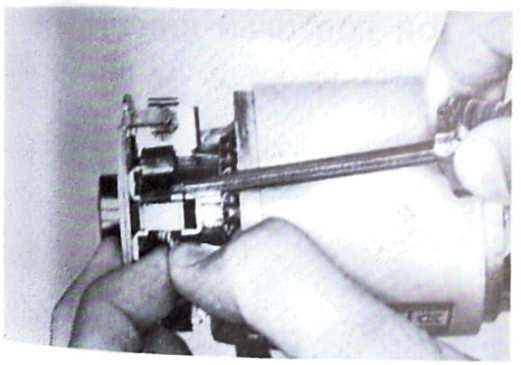
Using a magnet, remove the steel ball from the clutch shaft hole.



5. REMOVE BRUSHES AND BRUSH HOLDER

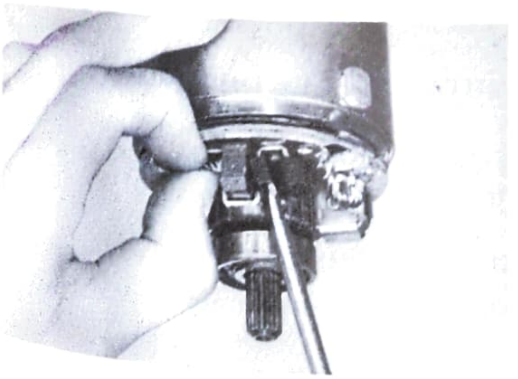
[1.0 kw type]

(a) Remove the two screws and pull off the end cover from the field frame.



(b) Using a screwdriver or steel wire, separate the brush and brush spring, and remove the brush from the brush holder.

(c) Pull the brush holder off the armature.



[1.4 kw type]

(a) Using a screwdriver, separate the brush and brush spring and remove the brush from the brush holder.

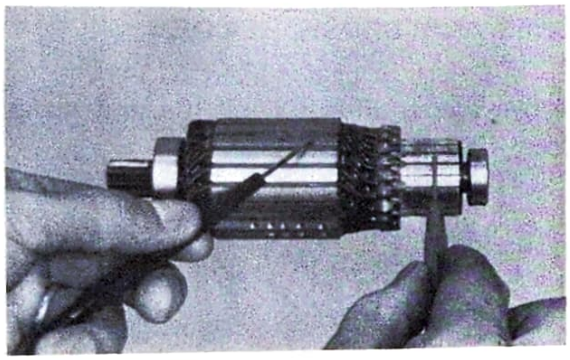
(b) Pull the brush holder off the armature.

6. REMOVE ARMATURE FROM FIELD FRAME

INSPECTION OF REDUCTION TYPE STARTER

CLEAN ALL PARTS

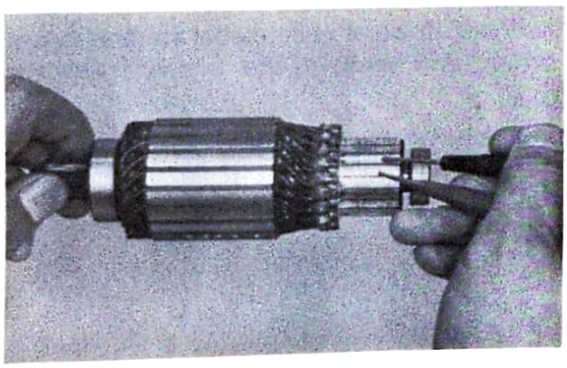
Wipe off dirt and grease with a rag.



Armature Coil

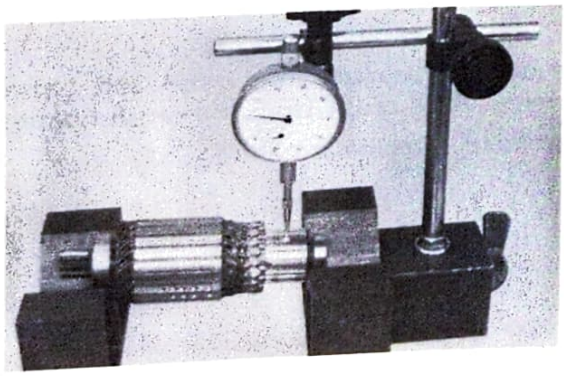
1. CHECK THAT COMMUTATOR IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.
If there is continuity, replace the armature.



2. CHECK COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the segments of the commutator.
If there is no continuity between any segment, replace the armature.



Commutator

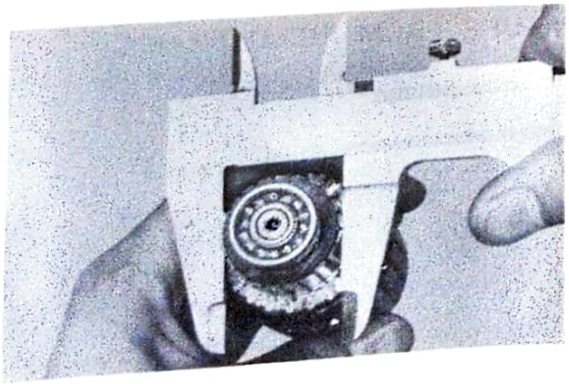
1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct with sandpaper (No. 400) or a lathe.

2. CHECK COMMUTATOR RUNOUT

If runout is greater than the maximum, correct with a lathe.

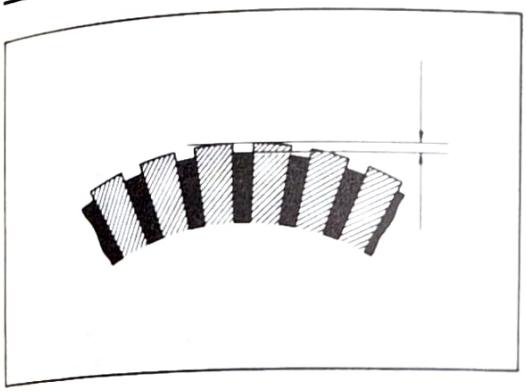
Maximum runout: 0.05 mm (0.0020 in.)



3. MEASURE DIAMETER OF COMMUTATOR

If the diameter of the commutator is less than the minimum, replace the armature.

Standard diameter: 30 mm (1.18 in.)
Minimum diameter: 29 mm (1.14 in.)



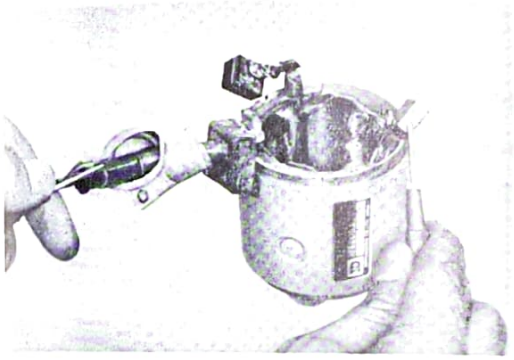
4. CHECK SEGMENT MICA

Check that the segment mica is clean and free of foreign particles.

If the mica depth is less than the minimum, correct with a hacksaw blade.

Standard mica depth:	**0.45 – 0.75 mm (0.0177 – 0.0295 in.)**
Minimum mica depth:	**0.2 mm (0.008 in.)**

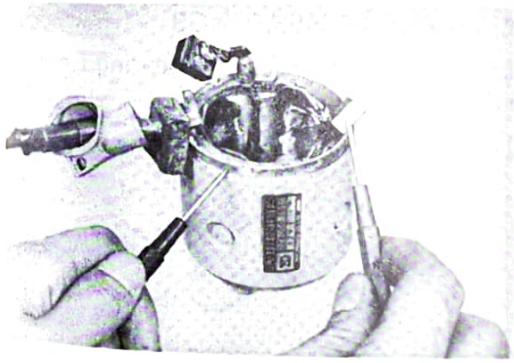
Field Coil



1. CHECK FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the lead wire and field coil brush lead.

If there is no continuity, replace the field coil.

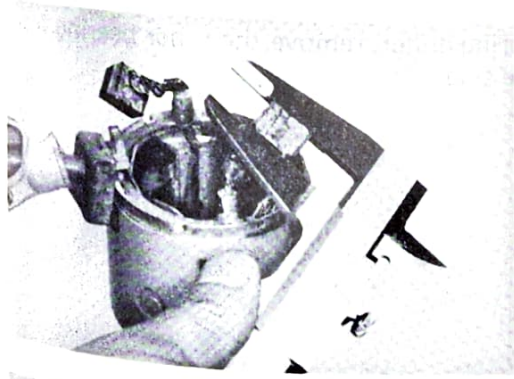


2. CHECK THAT FIELD COIL IS NOT GRAOUNDED

Using an ohmmeter, check for continuity between the field coil end and field frame.

If there is continuity, repair or replace the field coil.

Brushes

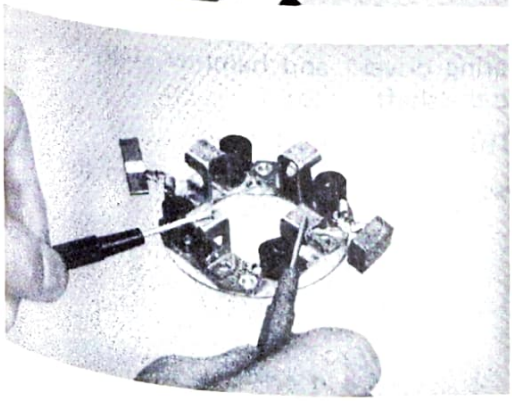


MEASURE BRUSH LENGTH

If length is less than minimum, replace the brush and dress with emery cloth.

Standard length:	**1.0 kw**	**13.5 mm (0.531 in.)**
	1.4 kw	**14.5 mm (0.571 in.)**
Minimum length:	**10 mm (0.39 in.)**	

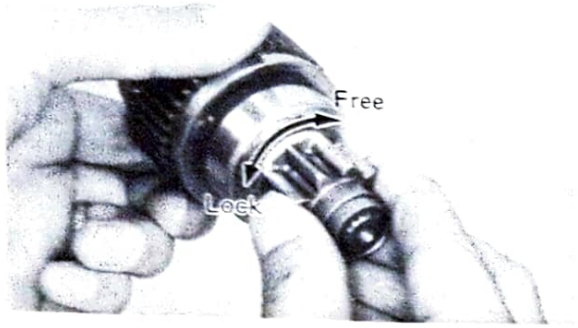
Brush Holder



CHECK INSULATION OF BRUSH HOLDER

Using an ohmmeter, check for continuity between ⊕ and ⊖ brush holders.

If there is continuity, repair or replace the brush holder.



Clutch and Gears

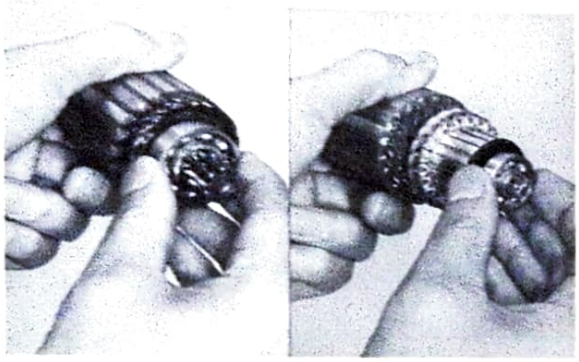
1. INSPECT GEAR TEETH

Inspect the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage. Replace if damaged.

If damaged, also inspect the flywheel ring gear for wear or damage.

2. CHECK PINION

Rotate the pinion clockwise and check that it turns freely. Try to rotate the pinion counterclockwise and check that it locks.

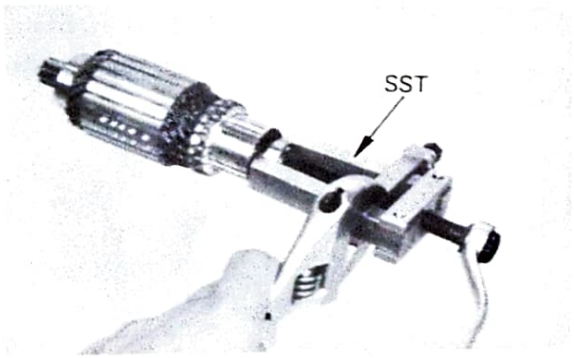


Bearings

1. CHECK BEARINGS

Turn each bearing by hand while applying force inward.

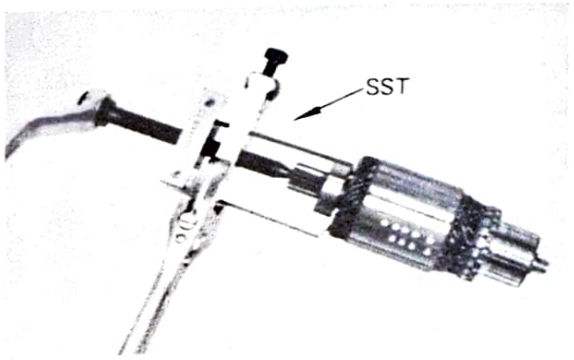
If resistance is felt or if the bearing sticks, replace the bearing.



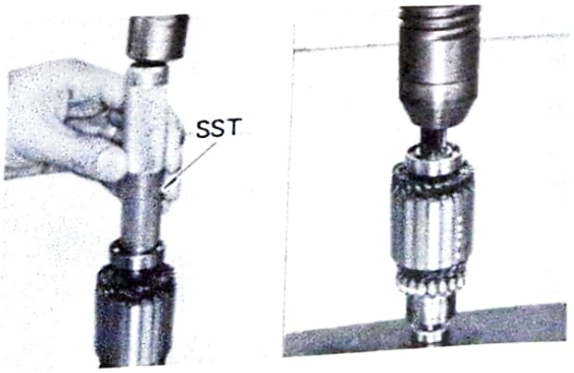
2. IF NECESSARY, REPLACE BEARINGS

(a) Using a bearing puller*, remove the bearing from the armature shaft.

*SST 09286-46011 or Commercial puller



(b) Using a bearing puller, remove the other bearing from the opposite side.



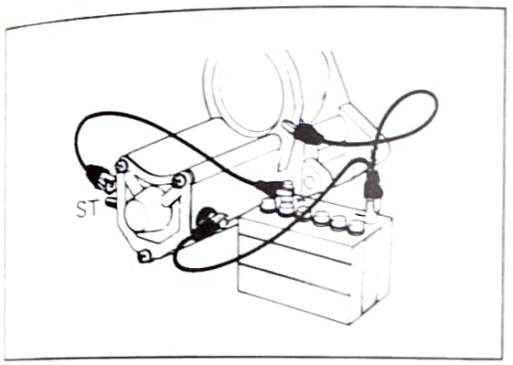
(c) Using a bearing driver* and hammer, tap the front bearing onto the shaft.

*SST 09285-76010 or Commercial driver

(d) Using a press, install the rear bearing onto the shaft.

Magnetic Switch

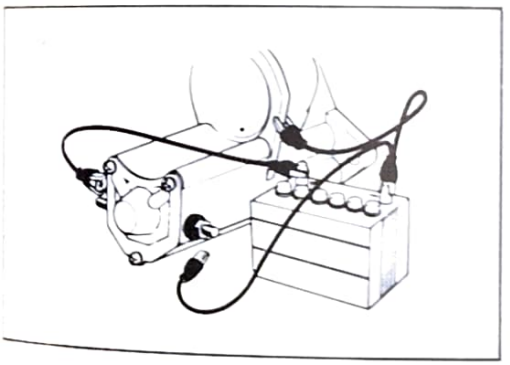
CUATION: These tests must be performed quickly (within 3 – 5 seconds) to prevent the coil from burning out.



1. PERFORM PULL-IN TEST

Connect the battery to the magnetic switch as shown. Check that the plunger moves outward.

If the plunger does not move, replace the magnetic switch.



2. PERFORM HOLD-IN TEST

While connected as above with the plunger out, disconnect the negative lead from the main terminal. Check that the plunger remains out.

If the plunger returns inward, replace the magnetic switch.

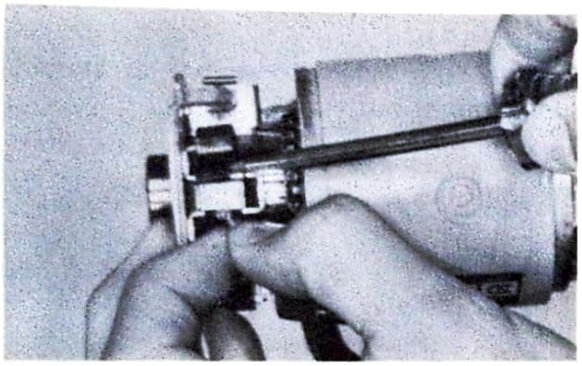
ASSEMBLY OF REDUCTION TYPE STARTER

(See illustration on page 7-3)

NOTE: Use high-temperature grease to lubricate bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

Apply grease to the armature rear bearing and insert armature into the field frame.



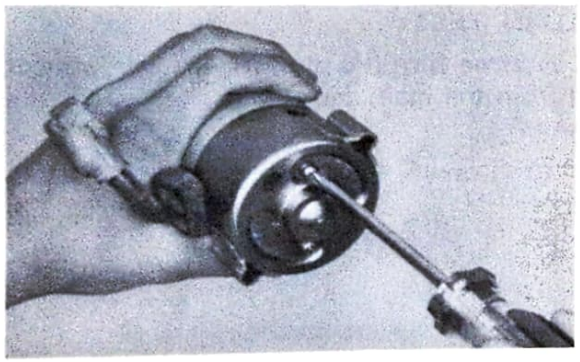
2. INSTALL BRUSH HOLDER AND BRUSHES

[1.0 kw type]

(a) Place the brush holder over the armature shaft.

(b) Using a screwdriver, hold the brush spring back and install the brush into the brush holder. Install four brushes.

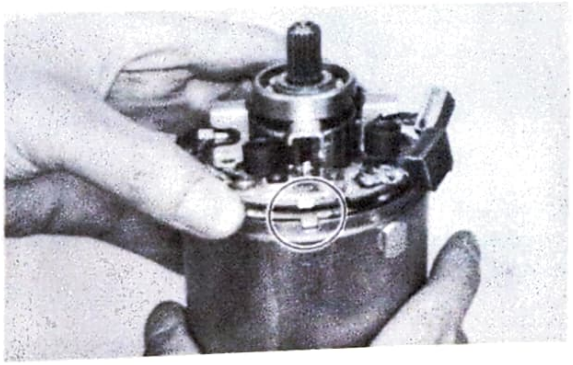
NOTE: Make sure that the ⊕ lead wires are not grounded.



(c) Install the end cover to the field frame.

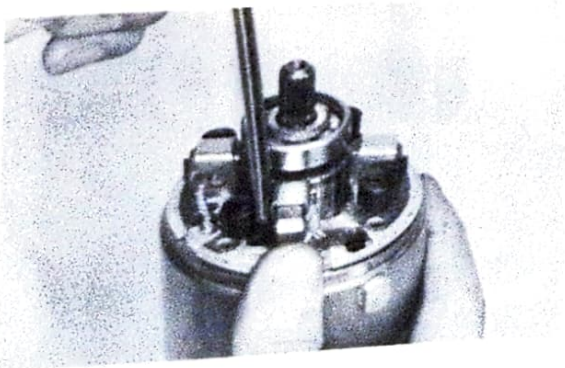
[1.4 kw type]

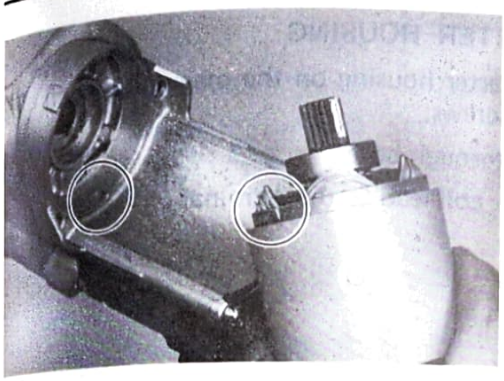
(a) Place the brush holder over the armature shaft and align the tab on the holder with the notch in the field frame.



(b) Using a screwdriver, hold the brush spring back and install the brush into the brush holder. Install four brushes.

NOTE: Make sure that the ⊕ lead wires are not grounded.



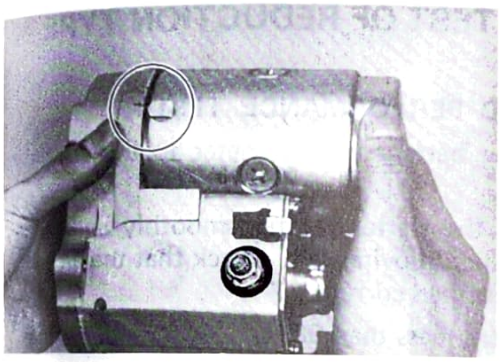


3. INSTALL FIELD FRAME WITH ARMATURE IN MAGNETIC SWITCH

[1.0 kw type]

(a) Place the felt seal on the armature shaft.

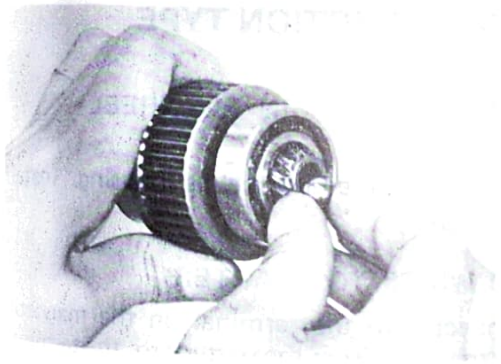
(b) Match the protrusion of the field frame with the magnetic switch.



[1.4 kw type]

(a) Place the felt seal on the armature shaft and the O-ring on the field frame.

(b) Hold the field frame so that the coil lead wire is toward the magnetic switch. Install the field frame with the armature in the magnetic switch and align the bolt anchor on the field frame with the mark on the switch.



4. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

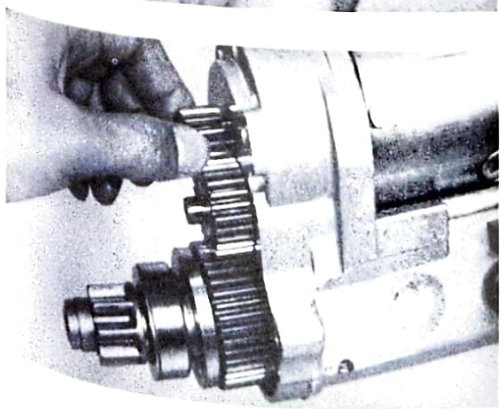
Apply grease to the ball and place into the clutch shaft hole.

5. INSTALL GEARS AND CLUTCH ASSEMBLY

[1.0 kw type]

(a) Apply grease to the idler gear and clutch assembly.

(b) Place the clutch assembly and idler gear in the starter housing.

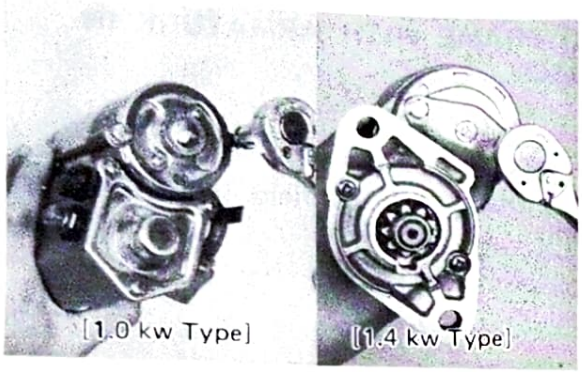


[1.4 kw type]

(a) Place the clutch assembly in the magnetic switch.

(b) Install the pinion and idler gears as shown, making sure that the gears mesh.

(c) Apply grease to the gears.

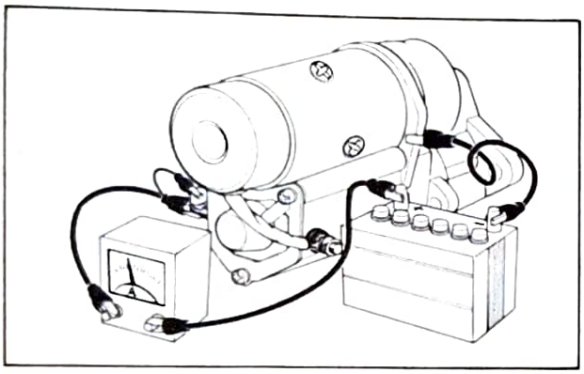


6. INSTALL STARTER HOUSING

(a) Place the starter housing on the magnetic switch and install two screws.

(b) Install two through bolts.

(c) Connect the coil lead to the terminal on the magnetic switch.



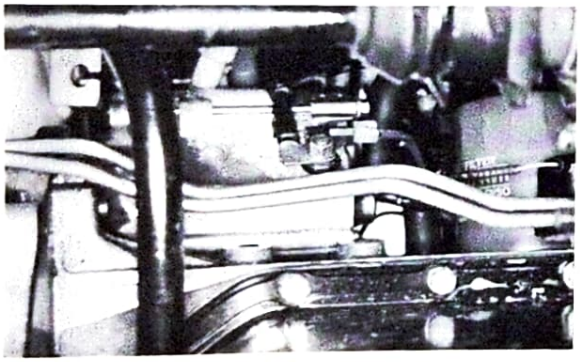
PERFORMANCE TEST OF REDUCTION TYPE STARTER

PERFORM ON-LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steady with the pinion moving out. Check that the ammeter reads the specified current.

Specified current: Less than 90 A



INSTALLATION OF REDUCTION TYPE STARTER

1. INSTALL STARTER MOTOR IN FLYWHEEL BELLHOUSING

Place the starter motor in the flywheel bellhousing. Install the two bolts.

2. CONNECT TWO WIRES TO STARTER

Connect the connector to the terminal on the magnetic switch. Connect the cable from the battery to the terminal on the switch, and install the nut.

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Check that the car starts.

CHARGING SYSTEM

	Page
PRECAUTIONS	8-2
TROUBLESHOOTING	8-2
SPECIAL TOOLS AND TEST EQUIPMENT	8-2
CHARGING CIRCUIT	8-3
ON-VEHICLE INSPECTION	8-4
ALTERNATOR	8-7
ALTERNATOR REGULATOR	8-16
TEST OF CHARGE LIGHT RELAY	8-18

PRECAUTIONS

1. Check that battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery when the engine is running.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition "ON" and engine off	Fuse blown	Check "GAUGES" and "ENGINE"* fuses	
	Light burned out	Replace light	
	Wiring connection loose	Tighten loose connections	
	Alternator voltage regulator faulty	Regulator	8-16
	Charge light relay faulty*	Check relay	8-18
	IC regulator faulty*	Replace IC regulator	8-5
Discharge warning light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt	8-4
	Battery cables loose, corroded or worn	Repair or replace cables	
	Fuse blown	Check "ENGINE" fuse	
	Fusible link blown	Replace fusible link	
	Alternator voltage regulator, charge light relay*, IC regulator* or alternator faulty	Check charging system	8-4
	Wiring faulty	Repair wiring	

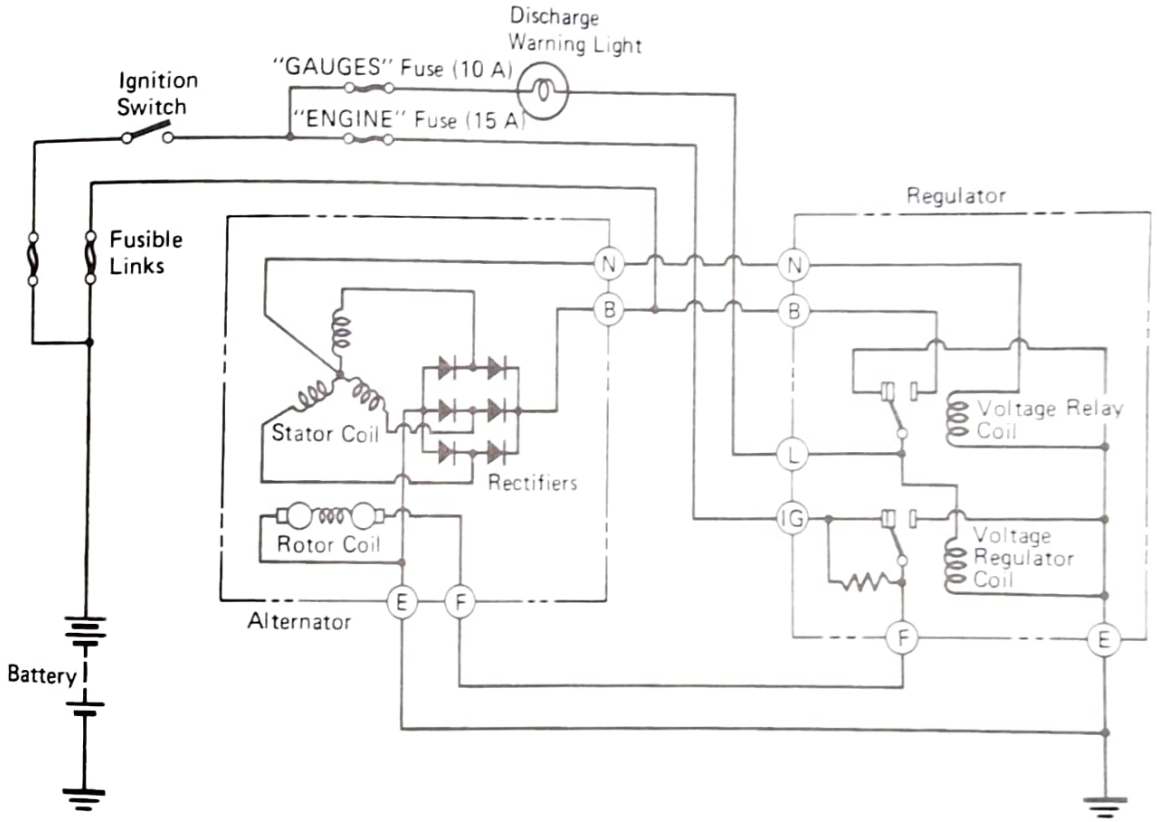
*IC Regulator Type only

SPECIAL TOOLS AND TEST EQUIPMENT

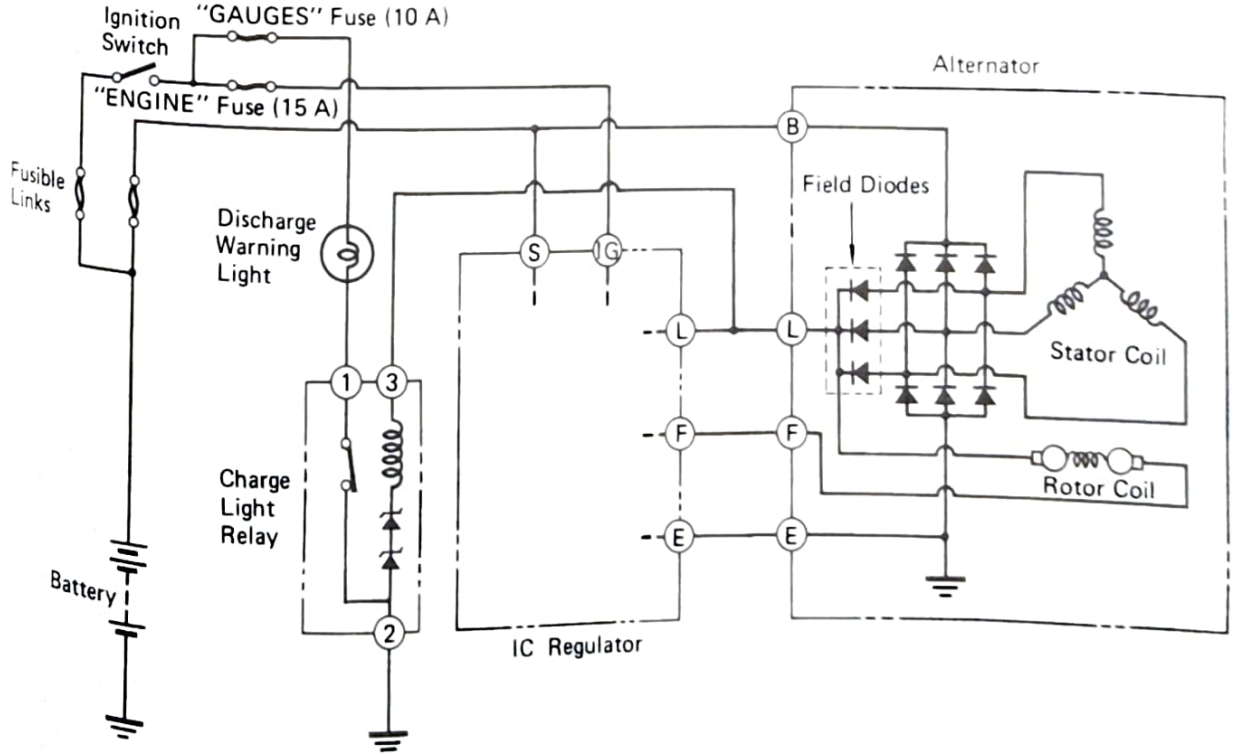
Tool	SST No.	Use
Battery/alternator tester	Commercial	To test charging circuit
Voltmeter/ohmmeter/ammeter	Commercial	To test charging circuit
Bearing pulley	09286-46011 or Commercial	To remove rear bearing

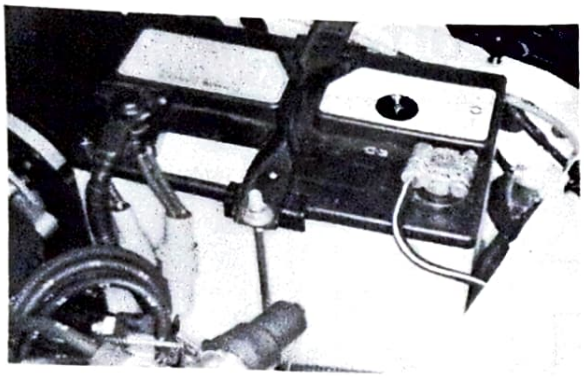
CHARGING CIRCUIT

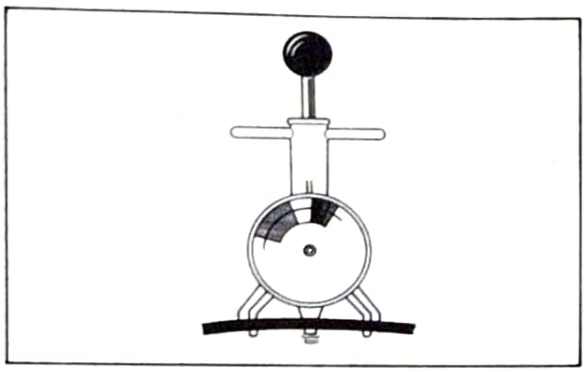
TIRRILL REGULATOR TYPE

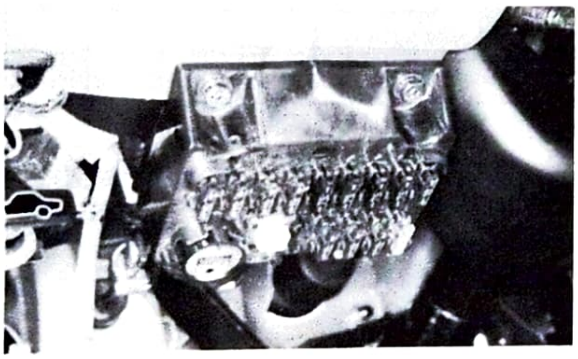


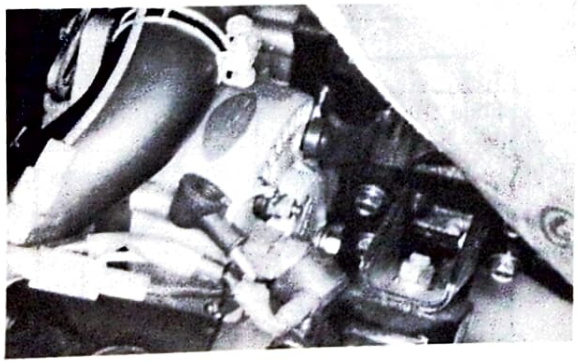
IC REGULATOR TYPE











ON-VEHICLE INSPECTION

1. CHECK BATTERY SPECIFIC GRAVITY

Check the specific gravity of each cell.

Standard specific gravity: 1.25 – 1.27 at 20°C (68°F)

2. CHECK BATTERY TERMINALS AND FUSIBLE LINK

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link for continuity.

3. CHECK DRIVE BELT TENSION

Drive belt tension:

New belt	**125 ± 25 lb**
Used belt	**80 ± 20 lb**

(W/ Borroughs belt tension gauge No. BT-33-73F)

4. CHECK FUSES FOR CONTINUITY

"ENGINE" fuse (15A)
"GAUGES" fuse (7.5A)

5. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there are no abnormal noises from the alternator while the engine is running.

6. CHECK DISCHARGE WARNING LIGHT CIRCUIT

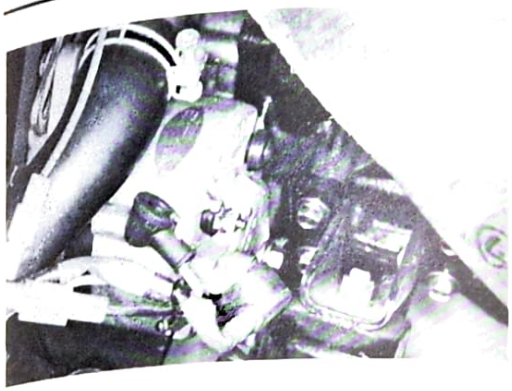
(a) Warm-up the engine and then turn it off.

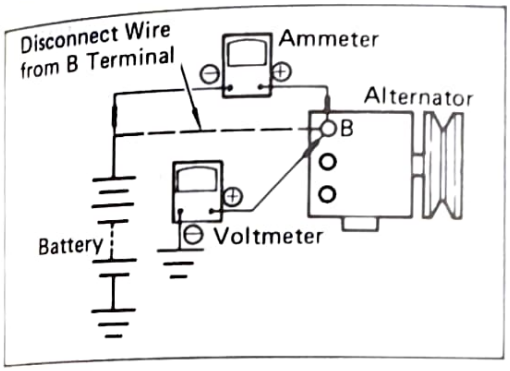
(b) Turn off all accessories.

(c) Turn the ignition switch to ON. Check that the discharge warning light is lit.

(d) Start the engine. Check that the light goes out.

If the light does not come on and go off as specified, troubleshoot the warning light circuit.





7. CHECK CHARGING CIRCUIT WITHOUT LOAD

NOTE: If a battery/alternator tester is available, connect the tester to the charging circuit per manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

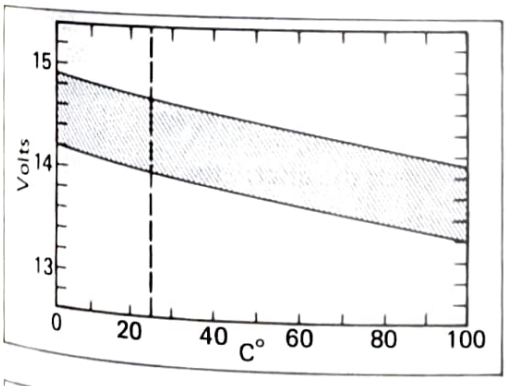
- Disconnect the wire from B terminal of the alternator and connect the wire to the negative terminal of ammeter.
- Connect the test lead from the positive terminal of the ammeter to the B terminal of the alternator.
- Connect the positive lead of the voltmeter to the B terminal of the alternator.
- Connect the negative lead of the voltmeter to ground.

(b) Check the charging circuit as follows:

TIRRILL Regulator Type

With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: Less than 10A
Standard voltage: 13.8 – 14.8 volts

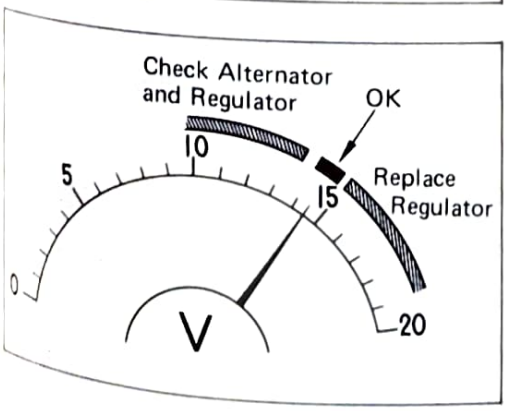


IC Regulator Type

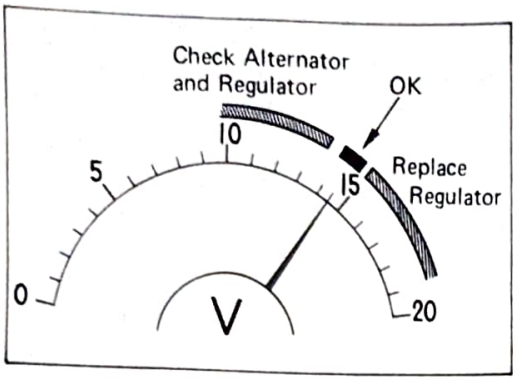
With the engine running at 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: Less than 10A
Standard voltage: 14.0 – 14.7 volts (25°C or 77°F)

NOTE: If the temperature is not 25°C (77°F), find the voltage limits in the chart for the correct temperature.

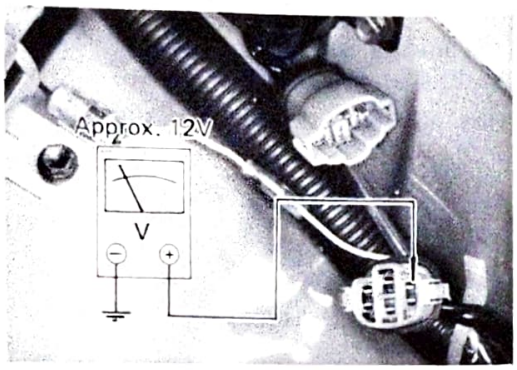


If the voltage reading is greater than 15.0 volts, replace the IC regulator.



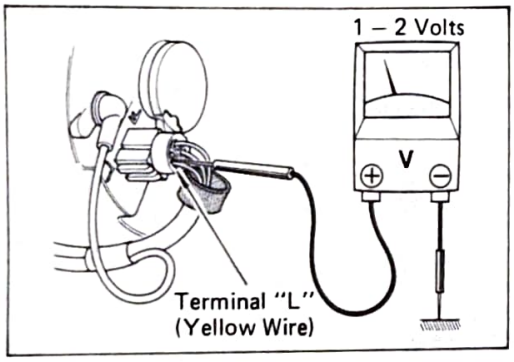
If the voltage reading is less than 13.5 volts, check the regulator and alternator as follows:

- Turn off the engine.
- Disconnect the connector from the IC regulator.
- Turn the ignition switch to ON.



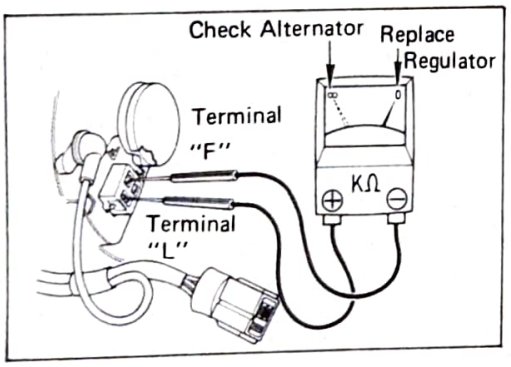
- Check the voltage reading at the red wire terminal as shown.

  If no voltage, check the "ENGINE" fuse and/or ignition switch.
- Connect the connector to the IC regulator.



- Check the voltage reading at the alternator "L" terminal.

  If the voltage reading is 1 – 2 volts, check the alternator. (See page 8-7)



If same as battery voltage, turn ignition switch OFF and disconnect the connector from the alternator. Check that there is continuity between alternator terminals "L" and "F".

No continuity – Check the alternator. (See page 8-7)

Continuity – Replace the IC regulator.

8. CHECK CHARGING CIRCUIT WITH LOAD

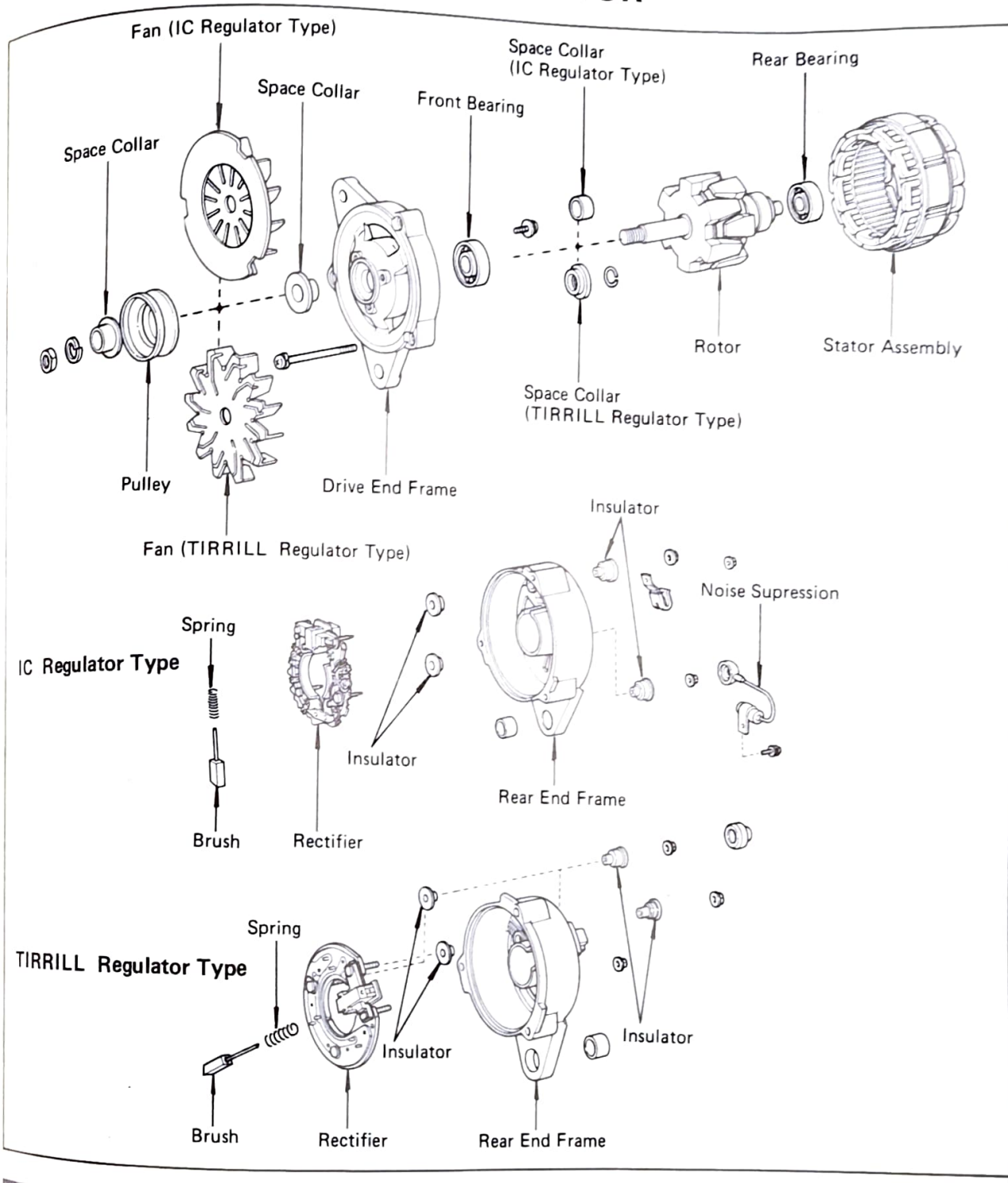
(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch to HI position.

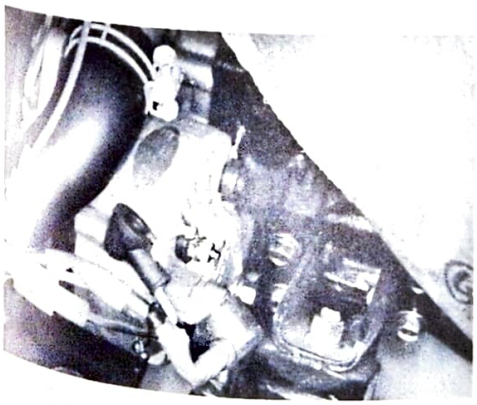
(b) Check the reading on the ammeter.

Standard amperage: More than 20A

If the ammeter reading is less than 20A, repair the alternator. (See page 8-7)

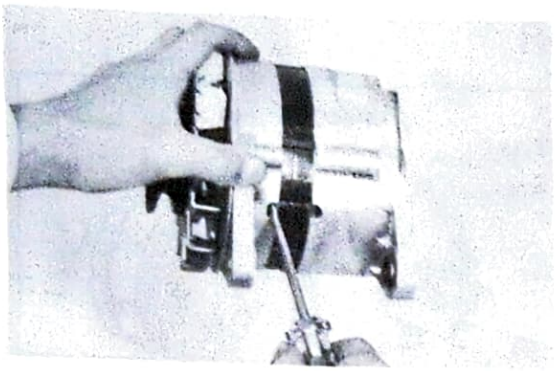
ALTERNATOR





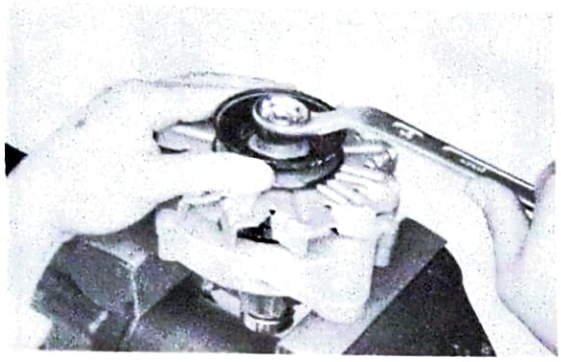
REMOVAL OF ALTERNATOR

1. DISCONNECT WIRING FROM ALTERNATOR
   (a) Disconnect the connector from the alternator.
   (b) Remove the nut and the wire from the alternator.
2. REMOVE ALTERNATOR
   (a) Remove the pivot and adjusting bolts.
   (b) Remove the drive belt from the pulley, and remove the alternator.

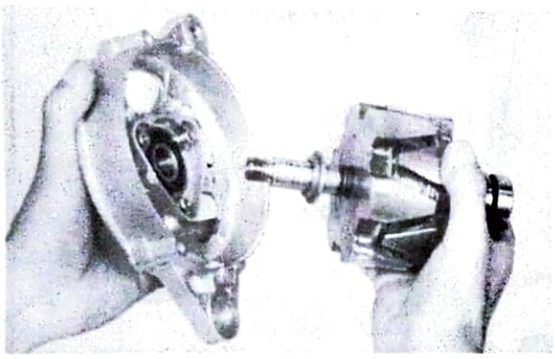


DISASSEMBLY OF ALTERNATOR
(See illustration on page 8-7)

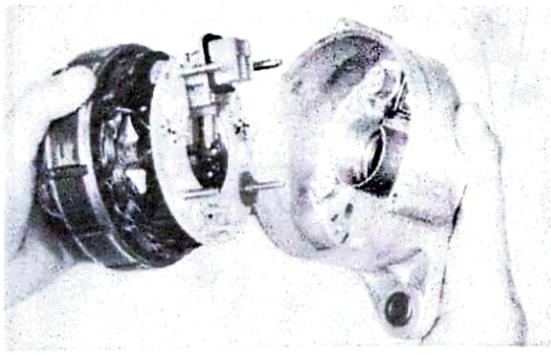
1. REMOVE DRIVE END FRAME FROM STATOR
   (a) Remove three through bolts.
   CAUTION: Do not pry coil wires.
   (b) Pry the drive end frame from the stator.



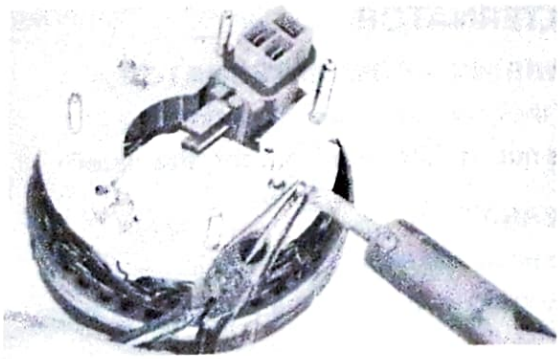
2. REMOVE PULLEY AND FAN
   (a) Clamp the rotor in a soft jaw vise.
   (b) Remove the pulley nut spring washer, space collar, pulley, fan and space collar.



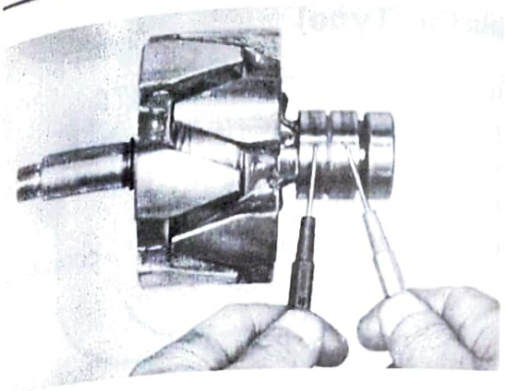
3. REMOVE ROTOR FROM DRIVE END FRAME



4. REMOVE REAR END FRAME FROM STATOR AND RECTIFIER HOLDER
   (a) Remove four nuts and terminal insulators.
   (b) Remove the noise suppression condenser. (IC Regulator Type)
   (c) Remove the rear end frame from the stator.
   (d) Remove the insulators from the rectifier holder studs.



5. UNSOLDER STATOR LEADS FROM RECTIFIER
   CAUTION: Protect rectifiers from heat.
   Hold the rectifier terminal with long nose pliers, and unsolder the leads.



INSPECTION OF ALTERNATOR

Rotor

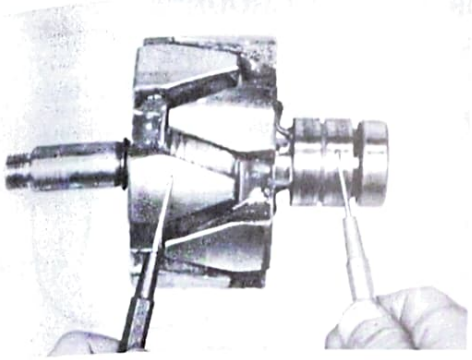
1. CHECK ROTOR FOR NO OPEN CIRCUITS

Using an ohmmeter, check for continuity between the slip rings.

Standard resistance:

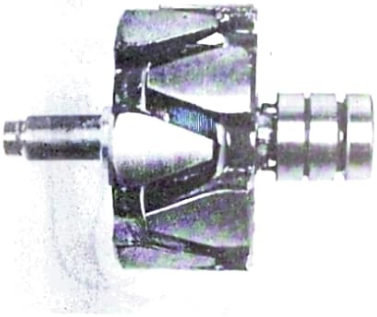
TIRRILL Regulator Type	3.9 – 4.1 ohms
IC Regulator Type	2.8 – 3.0 ohms

If there is no continuity, replace the rotor.



2. CHECK ROTOR FOR NO GROUND

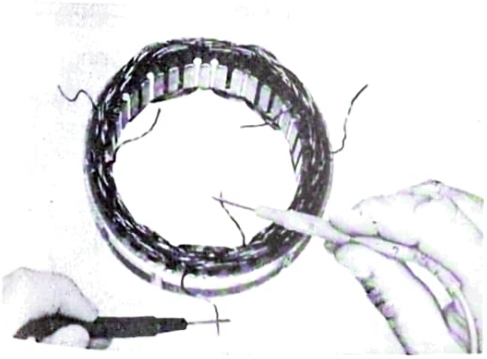
Using an ohmmeter, check that there is no continuity between the slip ring and the rotor. If there is continuity, replace the rotor.



3. INSPECT SLIP RINGS

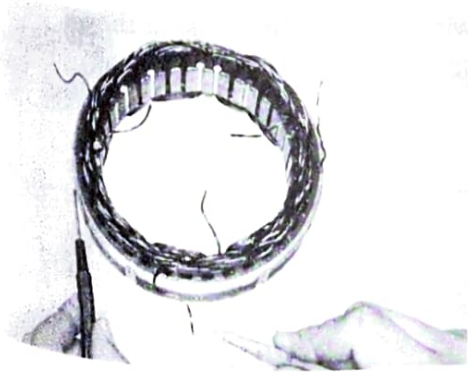
Check that the slip rings are not rough or scored. If the rings are rough or scored, replace the rotor.

Stator (TIRRILL Regulator Type)



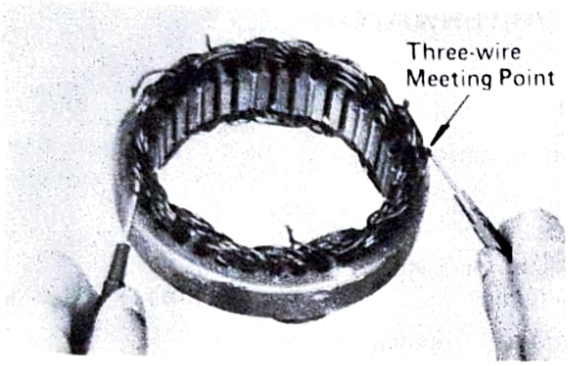
1. CHECK STATOR FOR NO OPEN CIRCUITS

Using an ohmmeter, check that there is continuity between the two leads near each other. If there is no continuity, replace the stator.



2. CHECK STATOR FOR NO GROUND

Using an ohmmeter, check that there is no continuity between the coil leads and stator core. If there is continuity, replace the stator.

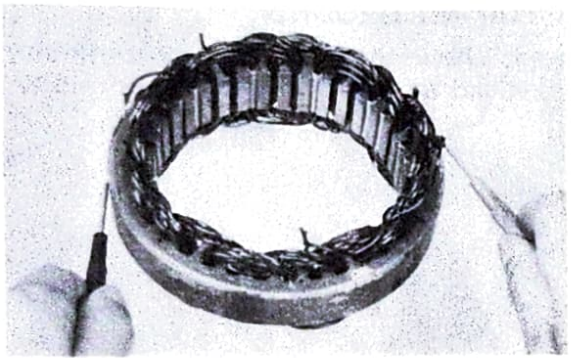


Stator (IC Regulator Type)

1. CHECK STATOR FOR NO OPEN CIRCUITS

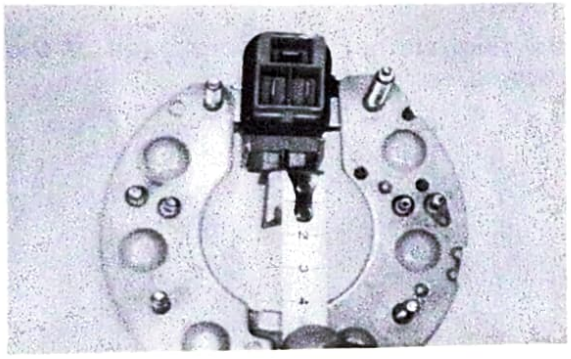
Using an ohmmeter, check that there is continuity between the three-wire meeting point and the other leads. If there is no continuity, replace the stator.

NOTE: At this time, the meeting wires should be connected with solder.



2. CHECK STATOR FOR NO GROUNDS

Using an ohmmeter, check that there is no continuity between the coil leads and stator core. If there is continuity, replace the stator.

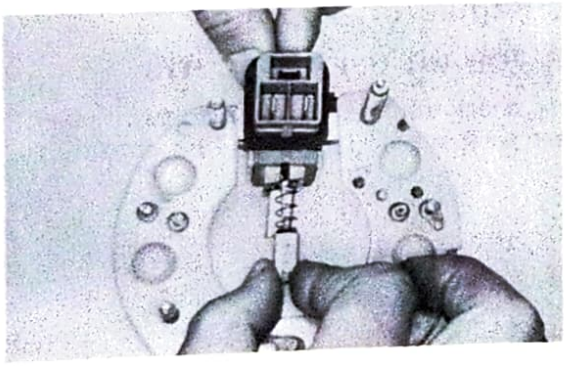


Brush and Brush Holder

1. MEASURE EXPOSED BRUSH LENGTH

Minimum exposed length: 5.5 mm (0.217 in.)

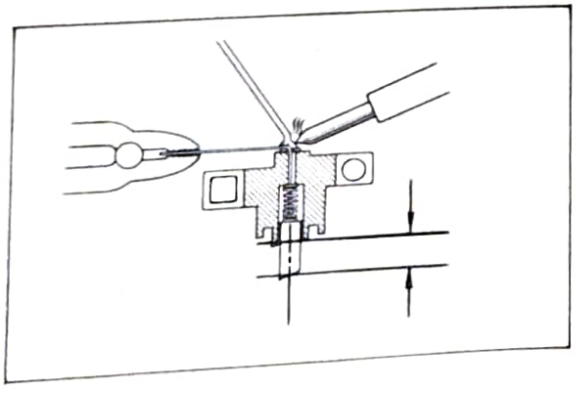
If the brush length is less than minimum, replace the brush.



2. IF NECESSARY REPLACE BRUSH

(a) Unsolder and remove the brush and the spring.

(b) Put the brush wire through the spring and install in the brush holder.



(c) Solder the wire to the brush holder as shown.

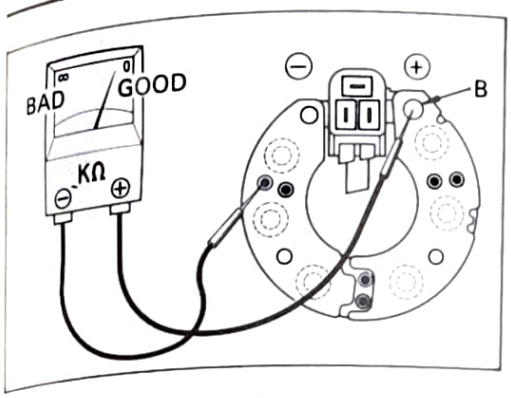
Standard exposed length: 12.5 mm (0.492 in.)

(d) Check that the brush moves smoothly in the brush holder.

(e) Cut off the excess wire.

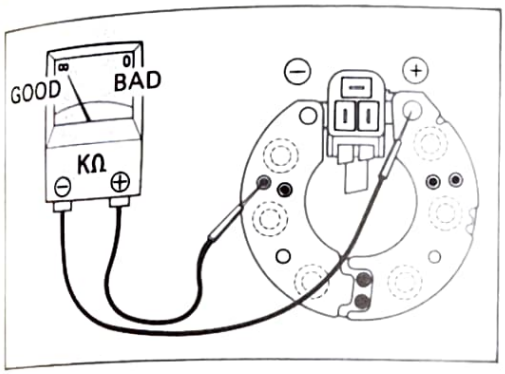
Rectifier Assembly (TIRRILL Regulator Type)

1. CHECK POSITIVE RECTIFIER



(a) Using an ohmmeter, connect the ⊕ lead to bolt B and the ⊖ lead to each outer lead, and check for continuity.

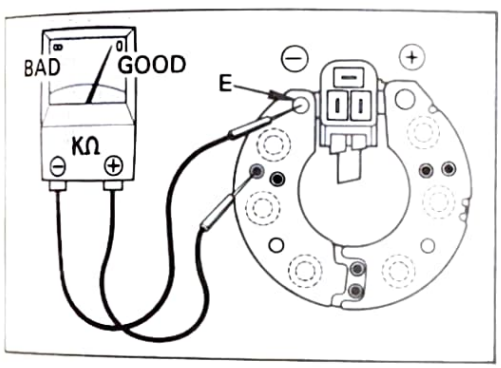
If there is no continuity, replace the rectifier assembly with brush.



(b) Reverse the test leads of the ohmmeter and check for continuity.

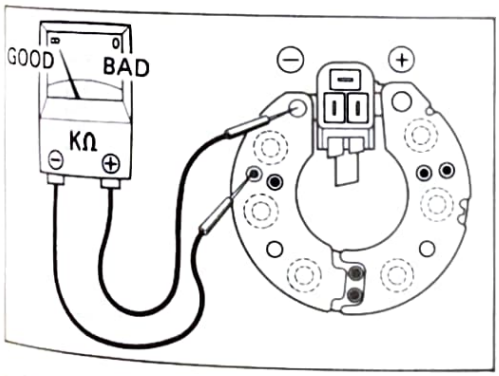
If there is continuity, replace the rectifier assembly with brush.

2. CHECK NEGATIVE RECTIFIER



(a) Using an ohmmeter, connect the ⊖ lead to bolt E and the ⊕ lead to each outer lead, and check for continuity.

If there is no continuity, replace the rectifier assembly with brush.

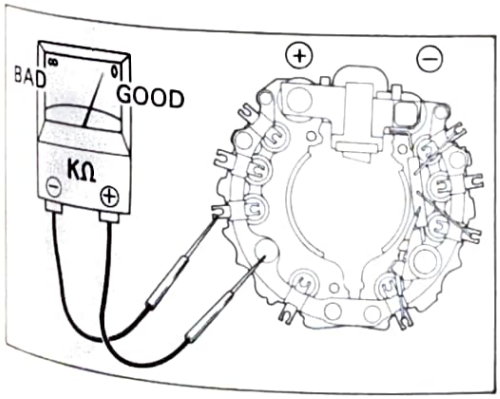


(b) Reverse the test leads of the ohmmeter and check for continuity.

If there is continuity, replace the rectifier assembly with brush.

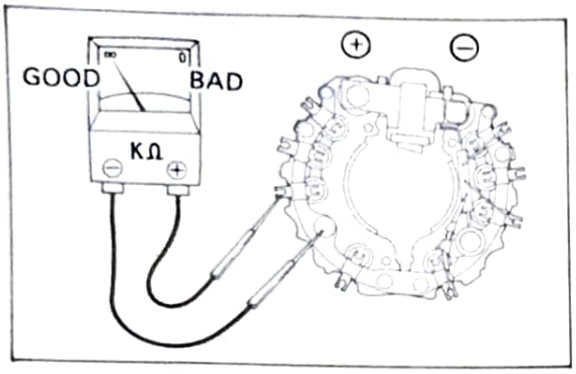
Rectifier Assembly (IC Regulator Type)

1. CHECK POSITIVE RECTIFIER



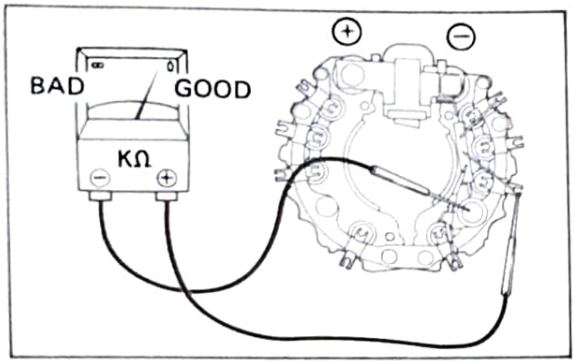
(a) Using an ohmmeter, connect the ⊕ lead to the rectifier holder and the ⊖ lead to each rectifier terminal, and check for continuity.

If there is no continuity, replace the rectifier assembly with brush.



(b) Reverse the test leads of the ohmmeter and check for continuity.

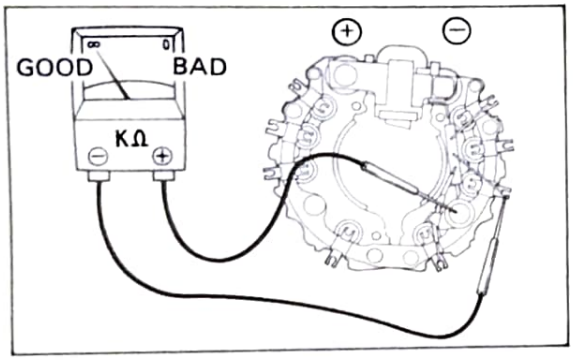
If there is continuity, replace the rectifier assembly with brush.



2. CHECK NEGATIVE RECTIFIER

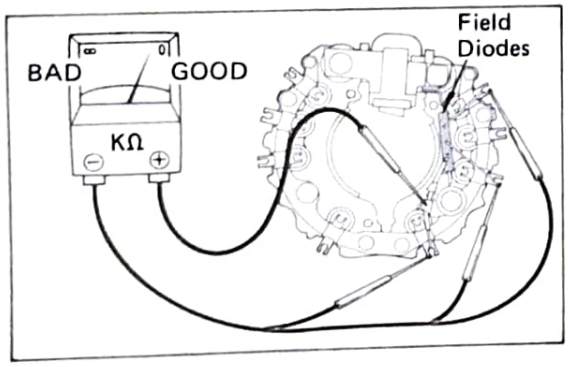
(a) Using an ohmmeter, connect the ⊕ lead to each rectifier terminal and the ⊖ lead to the rectifier holder, and check for continuity.

If there is no continuity, replace the rectifier assembly with brush.



(b) Reverse the test leads of the ohmmeter and check for continuity.

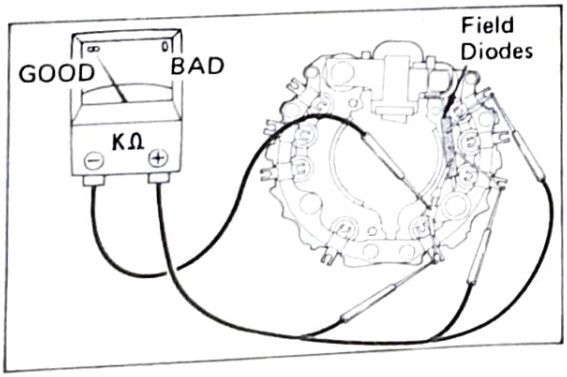
If there is continuity, replace the rectifier assembly with brush.



3. CHECK FIELD DIODES

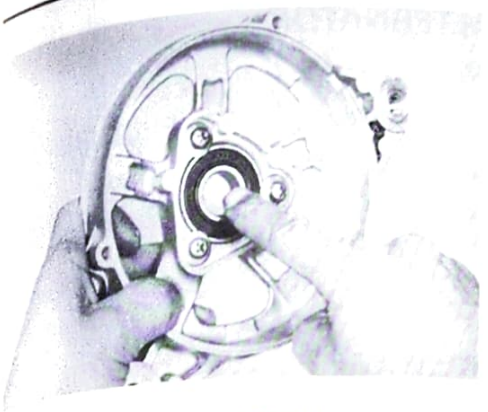
(a) Using an ohmmeter, connect the ⊕ lead to the ④ lead of the field diodes and the ⊖ lead to the ①, ② and ③ leads of the field diodes.

If there is no continuity, replace the rectifier assembly with brush.



(b) Reverse the test leads of the ohmmeter and check for continuity.

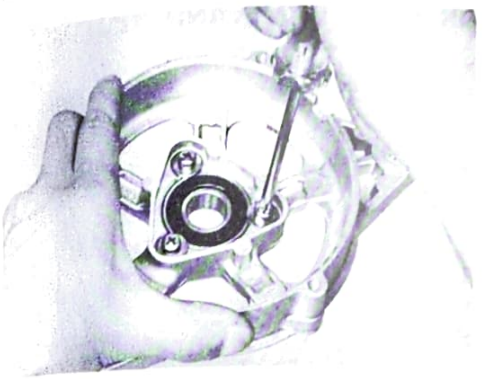
If there is continuity, replace the rectifier assembly with brush.



Bearings

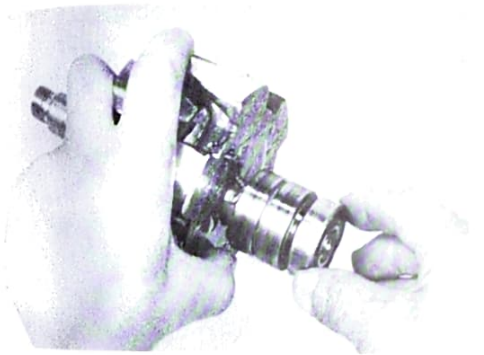
1. INSPECT FRONT BEARING

Check that the front bearing is not rough or worn. Replace if necessary.



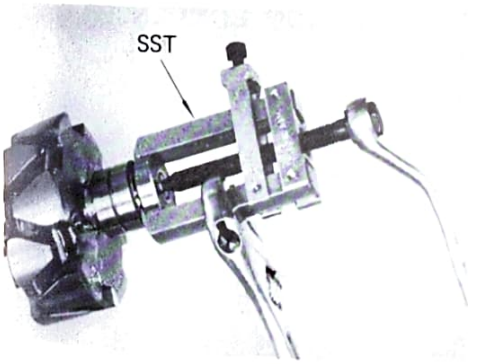
2. IF NECESSARY, REPLACE FRONT BEARING

Remove three screws and front bearing.



3. INSPECT REAR BEARING

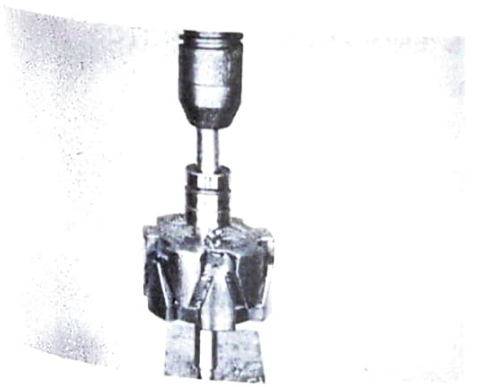
Check that the rear bearing is not rough or worn. Replace if necessary.



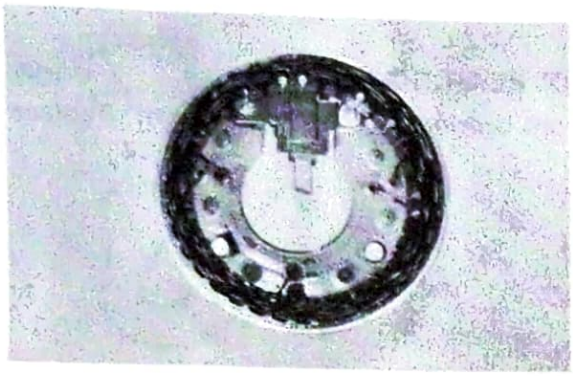
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using puller*, remove rear bearing from the rotor shaft.

*SST 09286-46011 or Commercial puller



(b) Using a press, install the rear bearing onto the rotor shaft.

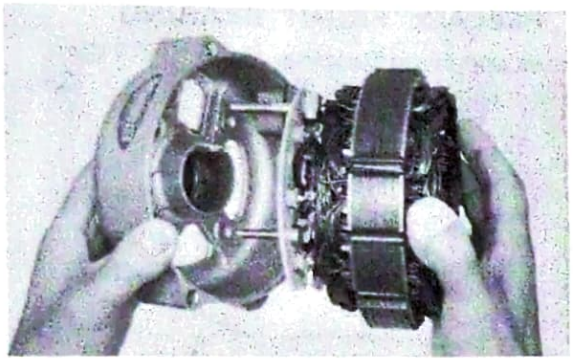


ASSEMBLY OF ALTERNATOR
(See illustration on page 8-7)

1. SOLDER EACH STATOR LEAD TO RECTIFIER

CAUTION: Protect the rectifiers from the heat.

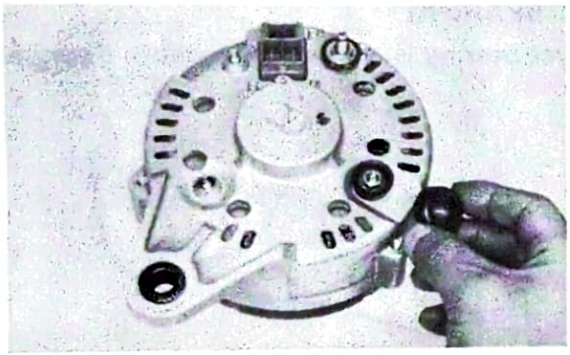
Hold the rectifier terminal with long nose pliers while soldering the leads.



2. ASSEMBLE REAR END FRAME AND RECTIFIER HOLDER

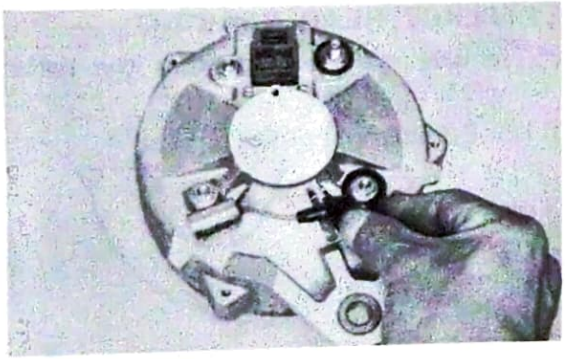
(a) Place two insulators on the positive side of the rectifier holder.

(b) Install rear end frame on the rectifier holder. Check that the wires are not touching the case.



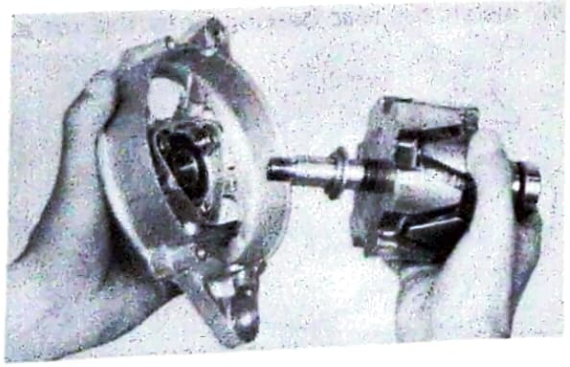
(c) Place two insulators on the positive side studs.

(d) Install four nuts on the studs.



3. INSTALL NOISE SUPRESSION CONDENSER (IC Regulator Type)

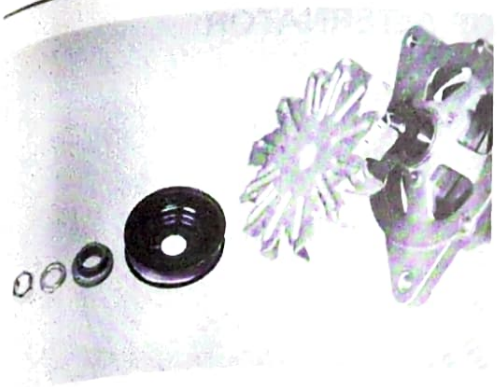
Mount the condenser on the stud and connect the lead wire to the "B" terminal of the alternator.



4. INSTALL DRIVE END FRAME ON ROTOR

(a) Slide the spacer collar on the rotor shaft.

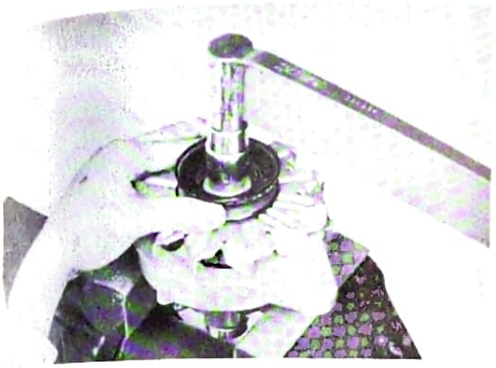
(b) Slide the drive end frame onto the rotor shaft.



5. INSTALL FAN AND PULLEY

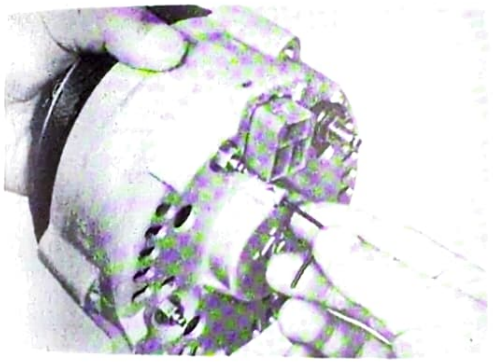
(a) Place the rotor in a soft jaw vise.

(b) Slide the spacer, fan, pulley and spacer collar on the rotor shaft.



(c) Tighten the nut.

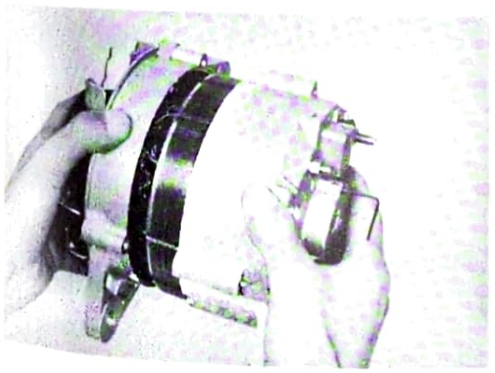
Torque: 5.0 – 6.5 kg-m (37 – 47 ft-lb)



6. ASSEMBLE DRIVE END FRAME AND RECTIFIER END FRAME

(a) Bend the rectifier lead wires back to clear the rotor.

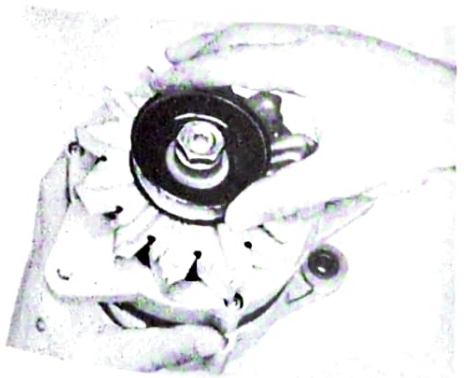
(b) Using a curved tool, push the brushes in as far as they will go and hold them in place by inserting a stiff wire through the access hole in the end frame.



(c) Install the drive end frame onto the rectifier end frame by inserting the rear bearing on the rotor shaft into the rear end frame.

(d) Install three through bolts.

(e) Remove the wire from the access hole.

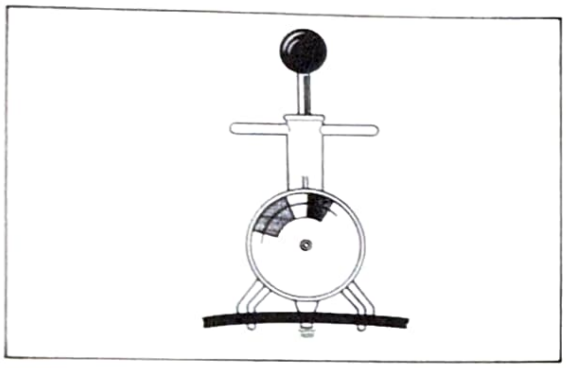


(f) Make sure the rotor rotates smoothly.

INSTALLATION OF ALTERNATOR

1. INSTALL ALTERNATOR

Mount the alternator on the engine bracket with pivot and adjusting bolts. Do not tighten the bolts.



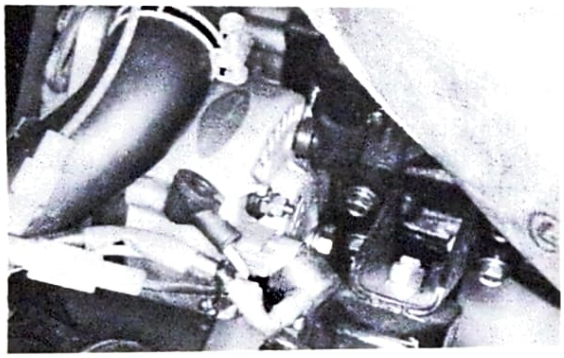
2. INSTALL DRIVE BELT

(a) Place the drive belt on the alternator, fan and crankshaft pulleys.

(b) Adjust the belt tension.

Drive belt tension:

New belt 125 ± 25 lb
Used belt 80 ± 20 lb
(W/Borroughs belt tension gauge No. BT-33-73F)



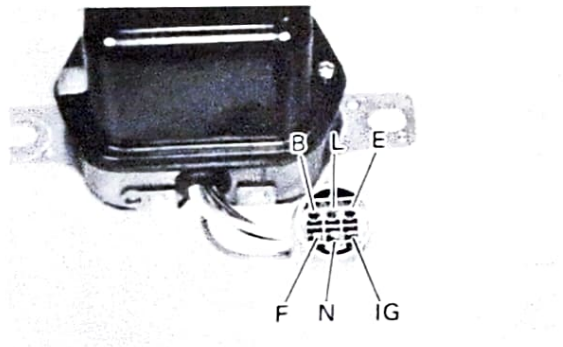
3. CONNECT WIRING TO ALTERNATOR

(a) Connect the wire to the alternator and install the nut.

(b) Connect the connector to the alternator.

4. PERFORM ON-VEHICLE INSPECTION

(See steps 6 through 8, page 8-4)

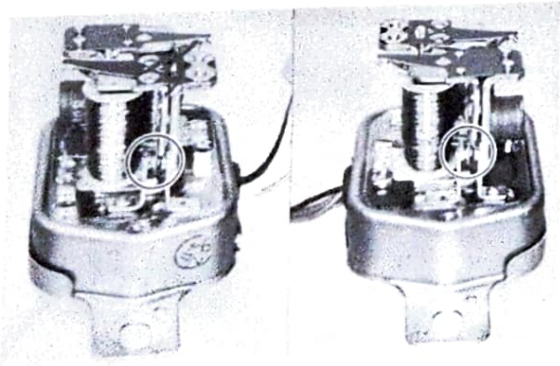


ALTERNATOR REGULATOR (TIRRILL Regulator)

INSPECTION OF ALTERNATOR REGULATOR

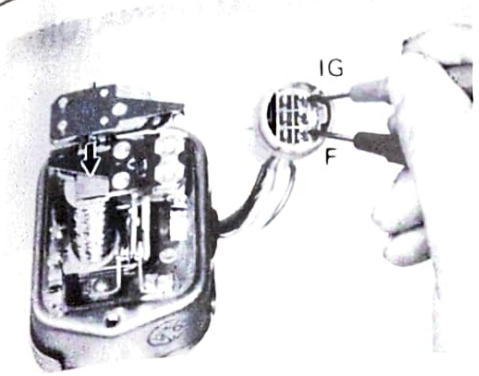
1. DISCONNECT REGULATOR CONNECTOR

2. REMOVE TWO MOUNTING BOLTS AND REGULATOR



3. INSPECT POINT SURFACES FOR BURN AND DAMAGE

If defective, replace the regulator.

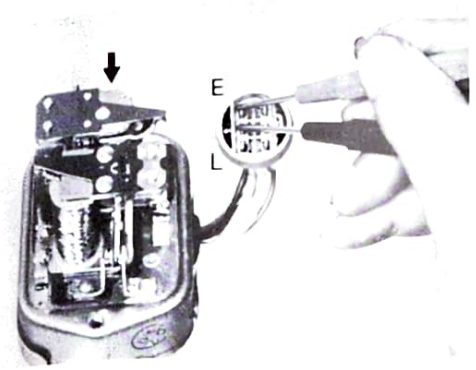


4. MEASURE RESISTANCE BETWEEN TERMINALS

(a) Using an ohmmeter, measure the resistance between terminals IG and F.

Resistance (Voltage regulator):

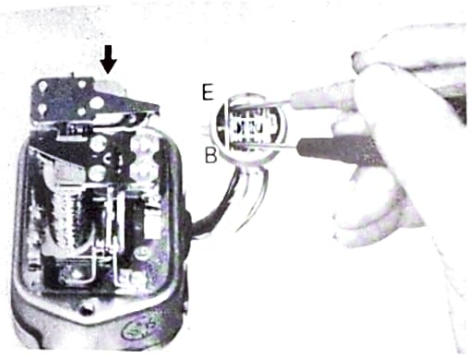
At rest	0 ohm
Pulled in	Approx. 11 ohms



(b) Using an ohmmeter, measure the resistance between terminals L and E.

Resistance (Voltage relay):

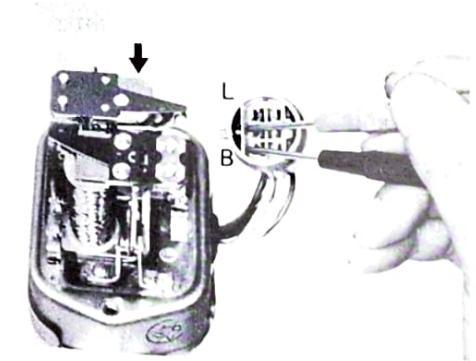
At rest	0 ohm
Pulled in	Approx. 100 ohms



(c) Using an ohmmeter, measure the resistance between terminals B and E.

Resistance (Voltage relay):

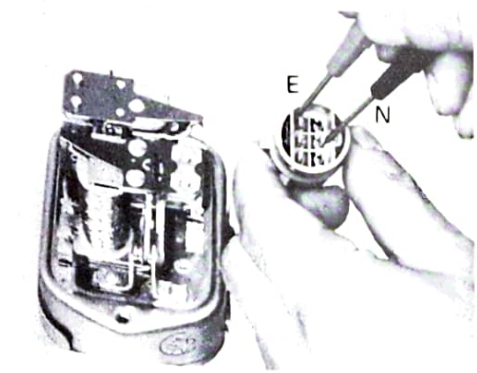
At rest	infinity
Pulled in	Approx. 100 ohms



(d) Using an ohmmeter, measure the resistance between terminals B and L.

Resistance (Voltage relay):

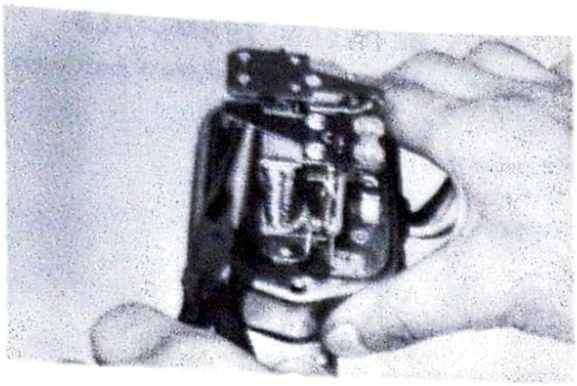
At rest	infinity
Pulled in	0 ohm



(e) Using an ohmmeter, measure the resistance between terminals N and E.

Resistance: Approx. 23 ohms

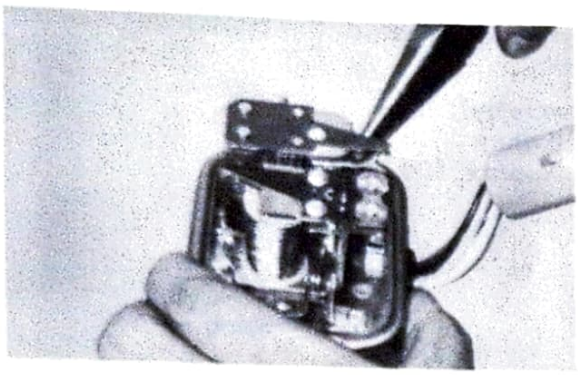
If any of the above checks are not correct, replace the alternator regulator.



VOLTAGE ADJUSTMENT OF ALTERNATOR REGULATOR

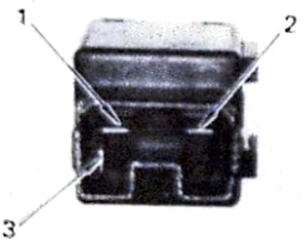
TO ADJUST VOLTAGE REGULATOR, BEND REGULATOR ADJUSTING ARM

Regulating voltage: 13.8 – 14.8 volts



TO ADJUST VOLTAGE RELAY, BEND RELAY ADJUSTING ARM

Relay actuating voltage: 4.5 – 5.8 volts



TEST OF CHARGE LIGHT RELAY (IC Regulator Type)

1. DISCONNECT RELAY CONNECTOR
2. REMOVE MOUNTING BOLT AND RELAY
3. CHECK RELAY FOR CONTINUITY
   (a) Using an ohmmeter, check that there is continuity between the 1 and 2 terminals.

   If there is no continuity, replace the relay.

   (b) Connect a positive ⊕ lead from the battery to the 3 terminal of the relay. Connect a negative ⊖ lead to terminal 2. Using an ohmmeter, check for continuity between 1 and 2 terminals.

   If there is continuity, replace the relay.
4. INSTALL RELAY

CLUTCH AND MANUAL TRANSMISSION

	Page
TROUBLESHOOTING	9-2
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CLUTCH RELEASE CYLINDER	9-7
CLUTCH UNIT	9-9
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W50 TRANSMISSION	9-56

TROUBLESHOOTING

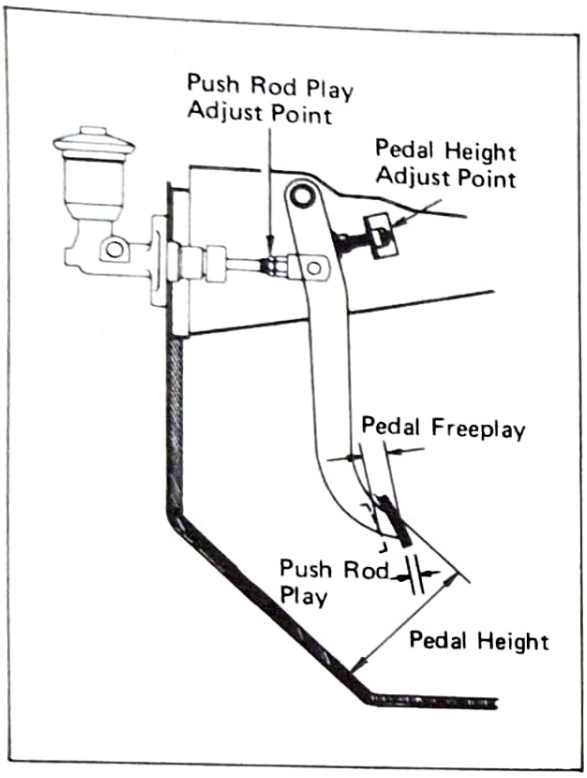
Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Clutch pedal freeplay excessive	Adjust pedal freeplay	9-4
	Clutch release cylinder faulty	Repair release cylinder	9-7
	Clutch master cylinder faulty	Repair master cylinder	9-6
	Clutch disc out of true, lining greasy or broken	Inspect clutch disc	9-9
	Splines on input shaft or clutch disc dirty or burred	Repair as necessary	9-9
	Clutch pressure plate faulty	Replace pressure plate	9-9
	Transmission faulty	Disassemble and inspect transmission	9-12, 56
Transmission jumps out of gear	Clutch pilot bearing worn	Replace pilot bearing	4-36
	Transmission faulty	Disassemble and inspect transmission	9-12, 56
Clutch slips	Clutch pedal freeplay insufficient	Adjust pedal freeplay	9-4
	Clutch disc lining oily or worn out	Inspect clutch disc	9-9
	Pressure plate faulty	Replace pressure plate	9-9
	Release fork binds	Inspect release fork	9-9
Clutch grabs/chatters	Clutch disc lining oily or worn out	Inspect clutch disc	9-9
	Pressure plate faulty	Replace pressure plate	9-9
	Clutch diaphragm bending	Align clutch diaphragm	9-9
	Engine mounts loose	Repair as necessary	
Clutch pedal spongy	Air in clutch lines	Bleed clutch system	9-4
	Clutch release cylinder faulty	Repair release cylinder	9-7
	Clutch master cylinder faulty	Repair master cylinder	9-6
Clutch noisy	Loose part inside housing	Repair as necessary	
	Release bearing worn or dirty	Replace release bearing	9-9
	Pilot bearing worn	Replace pilot bearing	4-36
	Release fork or linkage sticks	Repair as necessary	

SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
[CLUTCH]		
Flare nut wrench	09751-36011 or Commercial	To disconnect clutch line union
Clutch release bearing replacer	09315-00010 or Commercial	To replace clutch release bearing
Clutch guide tool	09301-20020	To install clutch
Diaphragm aligner tool set	09301-00012	To align clutch diaphragm
[L45, 48, 52 TRANSMISSION]		
Shift lever remover	09305-20012	To remove shift lever
Snap ring pliers	09905-00012 or Commercial	To remove snap ring
Back-up light switch tool	09817-16010	To remove back-up light switch
Universal puller	09950-20014	To remove sleeve, counter center bearing and output shaft rear bearing
Socket wrench	09326-22011 or Commercial	To loosen and tighten countershaft lock nut
Bearing replacer	09506-30011 or Commercial	To install input shaft bearing, clutch hub No. 1 and No. 2
Bearing puller	09310-36021	To remove countershaft rear bearing

SPECIAL TOOLS AND TEST EQUIPMENT (CONT'D)

Tool	SST No.	Use
Bushing replacer	09307-30010 or Commercial	To install countershaft rear bearing and replace extension housing bushing
Oil seal replacer	09304-12012 or Commercial	To install case cover oil seal
Hook	09921-00010 or Commercial	To remove speedometer driven gear oil seal
Oil seal replacer	09201-60011 or Commercial	To install speedometer driven gear oil seal
Oil seal replacer	09608-30021 or Commercial	To install input shaft oil seal
Oil seal puller	09308-00010 or Commercial or 09308-10010	To remove extension housing oil seal
Transmission oil plug	09325-20010 or Commercial	To install extension housing oil seal
Transmission oil plug	09325-12010 or Commercial	To install adapter oil seal
Bearing replacer	09309-35010 or Commercial	To install output shaft rear bearing, input shaft, countershaft center bearing and fifth gear
Bearing replacer	09310-35010 or Commercial	To install countershaft front bearing and sleeve
[W50 TRANSMISSION]		
Snap ring pliers	09905-00012 or Commercial	To remove snap ring
Allen wrench	09313-30021 or Commercial	To remove shift detent ball plug
Crankshaft pulley puller	09213-60016 or Commercial	To remove countershaft fifth gear
Universal pullers	09950-20014 or Commercial	To remove output shaft rear bearing and counter gear bearings
Bearing replacer	09506-30011 or Commercial	To install input shaft bearing, clutch hub No. 1, No. 2 and output shaft center bearing
Bearing replacer	09515-10010 or Commercial	To install counter gear front and center bearings
Hook	09921-00010 or Commercial	To remove speedometer driven gear oil seal
Oil seal replacer	09201-60011 or Commercial	To install speedometer driven gear oil seal
Oil seal puller	09308-00010 or Commercial or 09308-10010	To remove extension housing oil seal
Bushing replacer	09307-30010 or Commercial	To replace extension housing bushing
Transmission oil plug	09325-20010 or Commercial	To install extension housing oil seal
Bearing replacer	09612-22010 or Commercial	To install countershaft fifth gear
Bearing replacer	09310-35010 or Commercial	To install counter gear rear bearing
Bearing replacer	09515-20010 or Commercial	To install output shaft rear bearing
Bearing replacer	09309-35010 or Commercial	To install output shaft rear bearing



CHECK AND ADJUSTMENT OF CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT AND PUSH ROD PLAY IS CORRECT

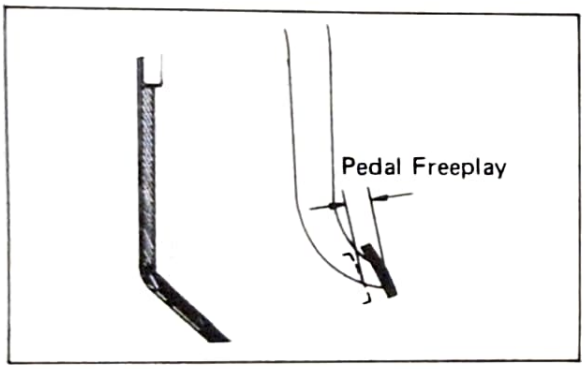
Pedal height: 152 – 162 mm (5.98 – 6.38 in.)
Push rod play at pedal top:
1.0 – 5.0 mm (0.039 – 0.197 in.)

If incorrect, adjust the pedal height and push rod play.

2. IF NECESSARY, ADJUST PEDAL HEIGHT AND PUSH ROD PLAY

(a) Loosen the lock nut and turn the stopper bolt until the height is correct. Tighten the lock nut.

(b) Loosen the lock nut and turn the push rod until the push rod play is correct. Tighten the lock nut.

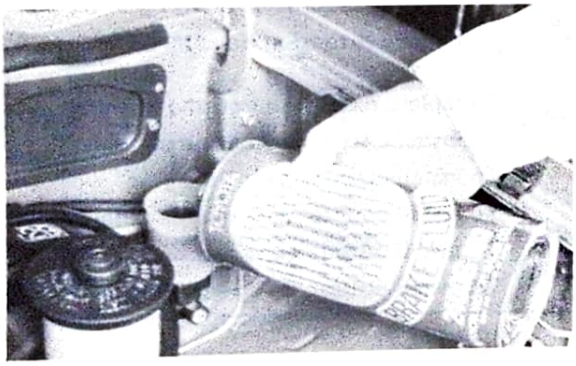


3. CHECK THAT PEDAL FREEPLAY IS CORRECT

Push in on the pedal until the beginning of clutch resistance is felt.

Pedal freeplay: 5 – 15 mm (0.20 – 0.59 in.)

If correct, recheck the master cylinder push rod play.



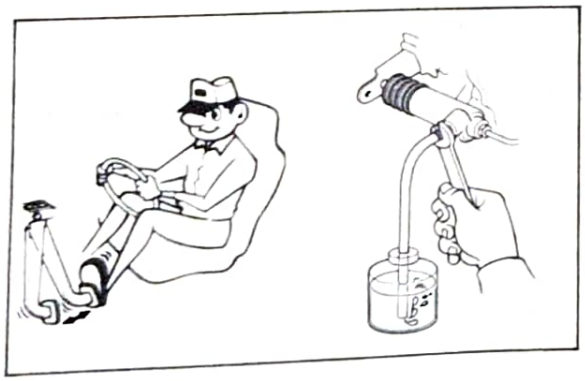
BLEEDING OF CLUTCH SYSTEM

NOTE: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.

CAUTION: DO NOT let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL CLUTCH RESERVOIR WITH BRAKE FLUID

Check the reservoir frequently. Add fluid if necessary.



2. CONNECT VINYL TUBE TO BLEEDER PLUG

Insert the other end of the tube in a half-filled container of brake fluid.

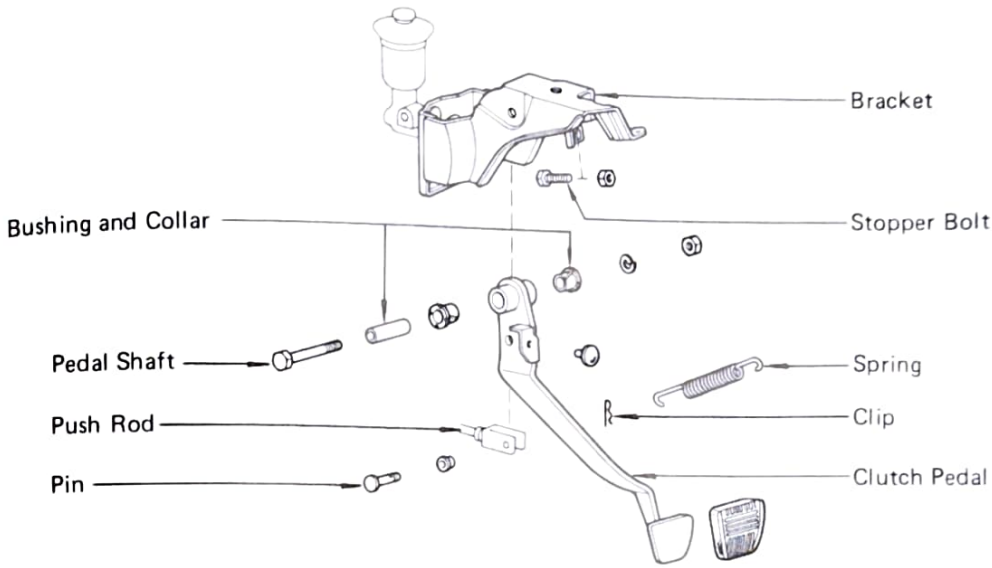
3. BLEED CLUTCH LINE

(a) Slowly pump the clutch pedal several times.

(b) While pressing on the pedal, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.

CLUTCH PEDAL

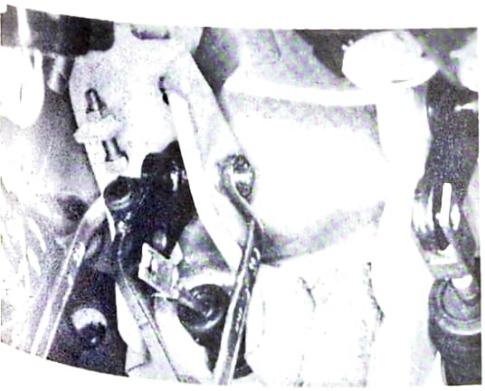


REMOVAL OF CLUTCH PEDAL

1. REMOVE SPRING
2. REMOVE PUSH ROD PIN
   Remove clip and pull out the push rod pin.
3. REMOVE PEDAL SHAFT
4. REMOVE CLUTCH PEDAL WITH BUSHINGS AND COLLAR

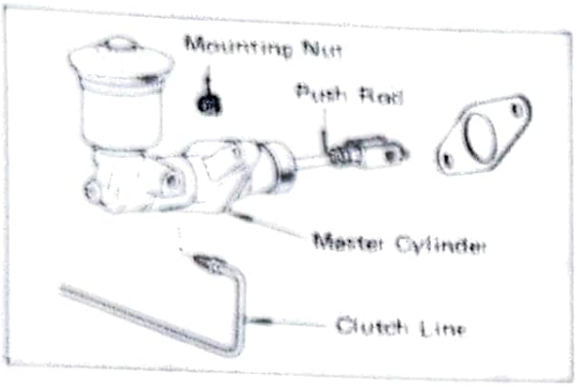
INSPECTION OF CLUTCH PEDAL PARTS

INSPECT ALL PARTS FOR WEAR OR DAMAGE



INSTALLATION OF CLUTCH PEDAL

1. COAT BUSHINGS WITH MULTIPURPOSE GREASE
2. PLACE CLUTCH PEDAL WITH BUSHINGS AND COLLAR IN POSITION
3. INSTALL PEDAL SHAFT
4. INSTALL PUSH ROD PIN AND CLIP
5. INSTALL SPRING



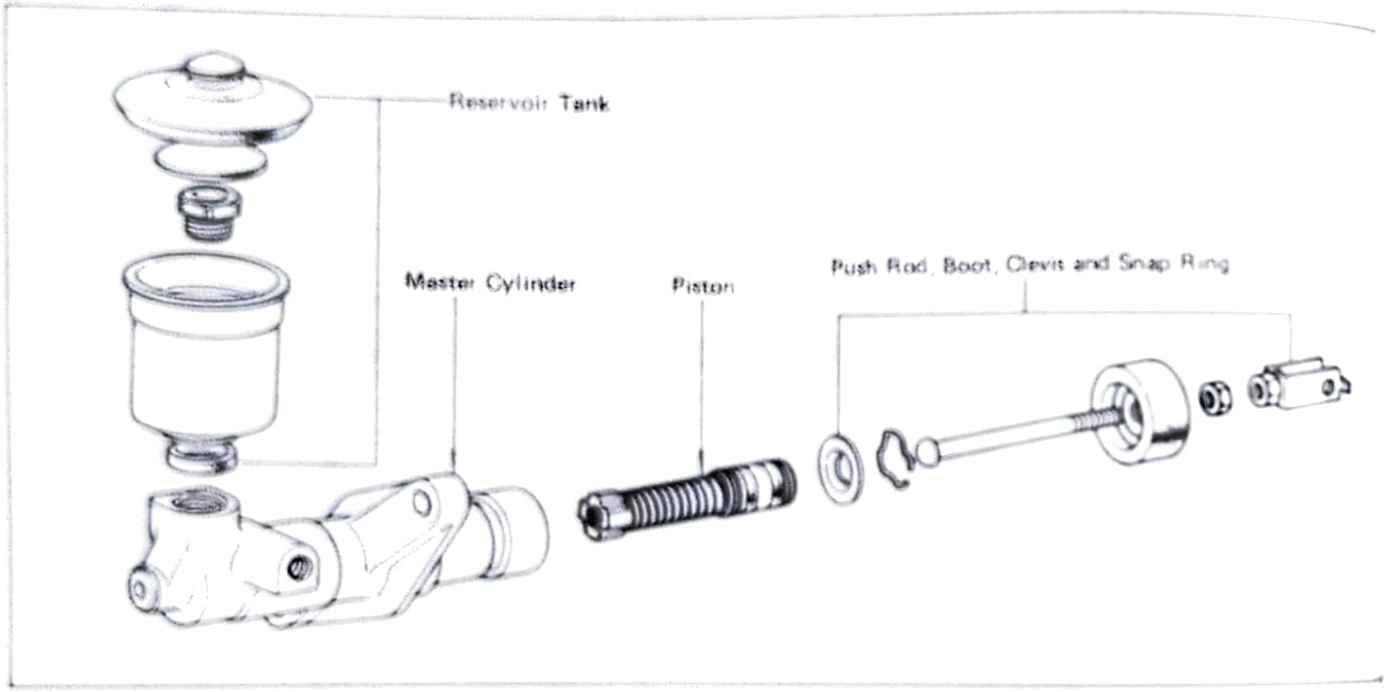
CLUTCH MASTER CYLINDER

REMOVAL OF MASTER CYLINDER

1. REMOVE PUSH ROD PIN
2. DISCONNECT CLUTCH LINE UNION

   Using a flare nut wrench*, disconnect the union.

   *SST 09751-36011 or Commercial wrench
3. REMOVE MOUNTING NUTS AND PULL OUT MASTER CYLINDER



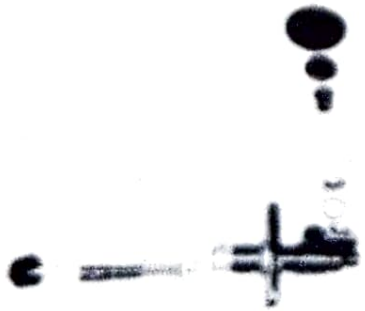
DISASSEMBLY OF MASTER CYLINDER

1. REMOVE RESERVOIR TANK

   Remove the hold-down bolt and pull off the tank.
2. REMOVE PUSH ROD AND PISTON

   (a) Pull back the boot and, using a screwdriver, remove the snap ring.

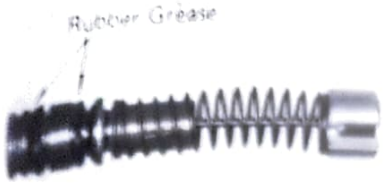
   (b) Pull out the push rod, washer and piston.



INSPECTION OF CYLINDER PARTS

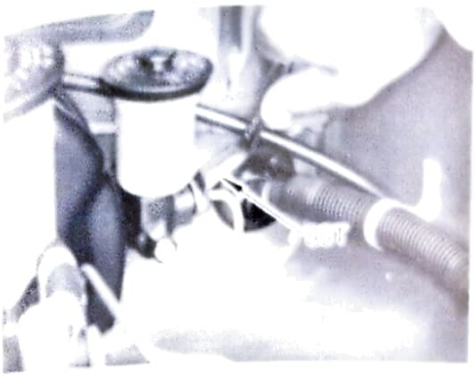
1. WASH ALL PARTS IN CLEAN BRAKE FLUID
2. INSPECT PARTS FOR WEAR OR DAMAGE

   Replace parts as necessary.



ASSEMBLY OF MASTER CYLINDER
(See illustration on page 9-6)

1. COAT PARTS WITH RUBBER GREASE AS SHOWN
2. INSERT PISTON INTO CYLINDER
3. INSTALL PUSH ROD ASSEMBLY WITH SNAP RING

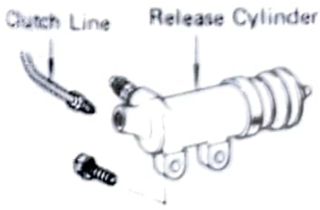


INSTALLATION OF MASTER CYLINDER

1. INSTALL MASTER CYLINDER WITH MOUNTING NUTS
2. CONNECT CLUTCH LINE UNION
   Using a flare nut wrench*, connect the union.
   *SST 09751-36011 or Commercial wrench
3. CONNECT PUSH ROD AND INSTALL PIN
   Secure the pin with clip.
4. ADJUST CLUTCH PEDAL AND BLEED SYSTEM
   (See page 9-4)

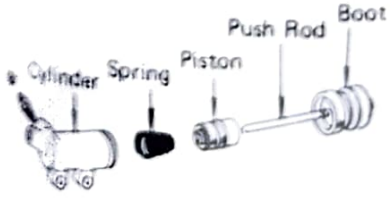
CLUTCH RELEASE CYLINDER

REMOVAL OF RELEASE CYLINDER

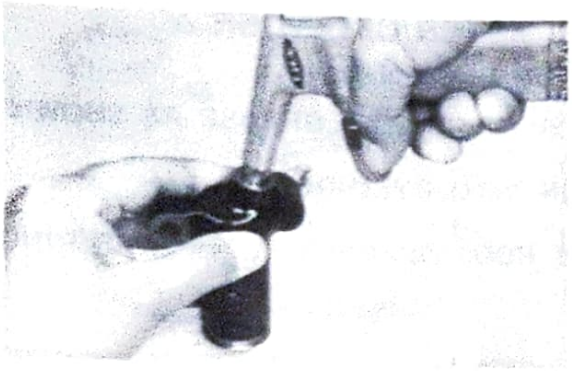


1. DISCONNECT CLUTCH LINE UNION
   Using a flare nut wrench*, disconnect the union.
   *SST 09751-36011 or Commercial wrench
2. REMOVE TWO BOLTS AND PULL OFF RELEASE CYLINDER

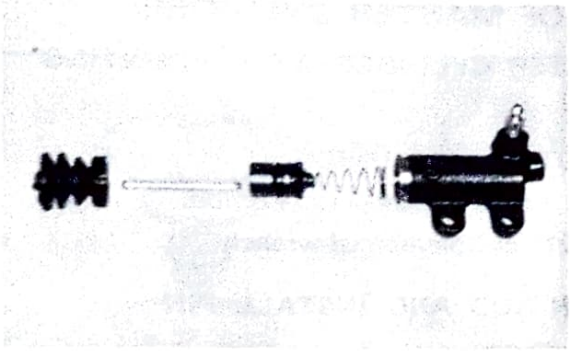
DISASSEMBLY OF RELEASE CYLINDER



1. PULL OUT PUSH ROD
2. REMOVE BOOT

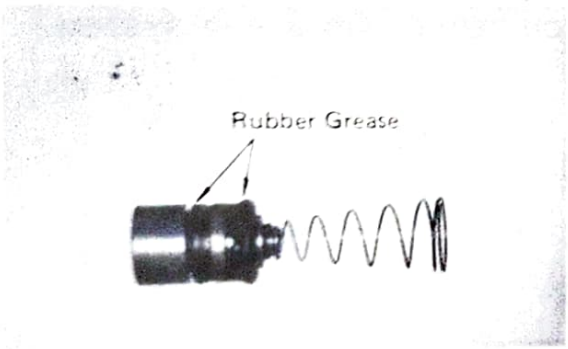


3. REMOVE PISTON
   Using compressed air, remove the piston from the cylinder.
4. REMOVE SPRING



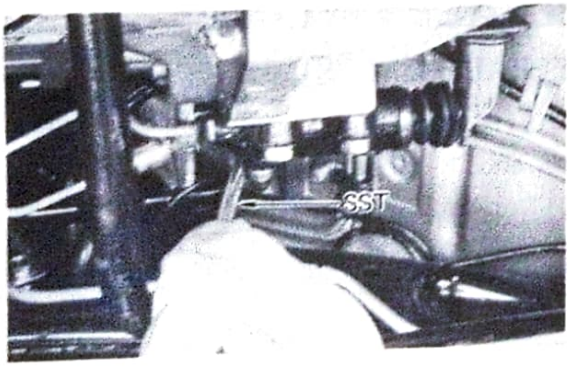
INSPECTION OF RELEASE CYLINDER PARTS

1. WASH ALL PARTS IN CLEAN BRAKE FLUID
2. INSPECT PARTS FOR WEAR OR DAMAGE
   Replace parts as necessary.



ASSEMBLY OF RELEASE CYLINDER
(See illustration on page 9-7)

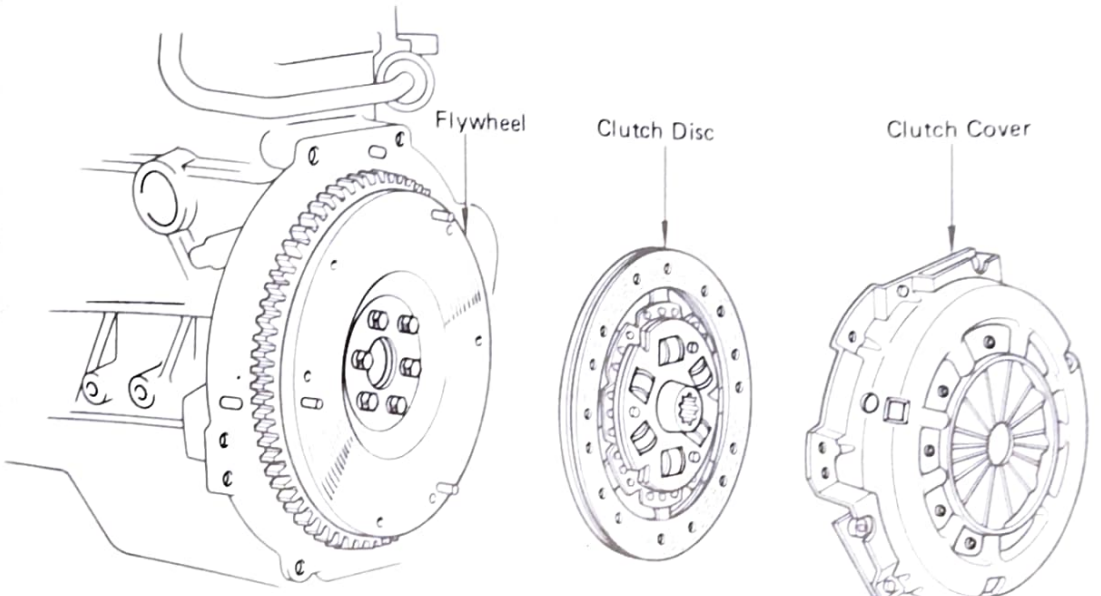
1. INSTALL SPRING ON PISTON
2. COAT PISTON WITH RUBBER GREASE
3. INSTALL PISTON
4. INSTALL BOOT AND INSERT PUSH ROD

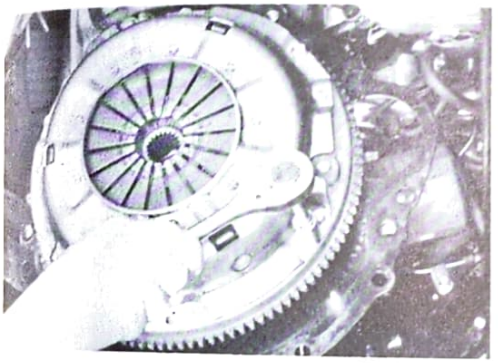


INSTALLATION OF RELEASE CYLINDER
(See illustration on page 9-7)

1. INSTALL RELEASE CYLINDER WITH TWO BOLTS
2. CONNECT CLUTCH LINE UNION
   Using a flare nut wrench*, connect the union.
   *SST 09751-36011 or Commercial wrench
3. BLEED CLUTCH SYSTEM (See page 9-4)

CLUTCH UNIT





REMOVAL OF CLUTCH UNIT

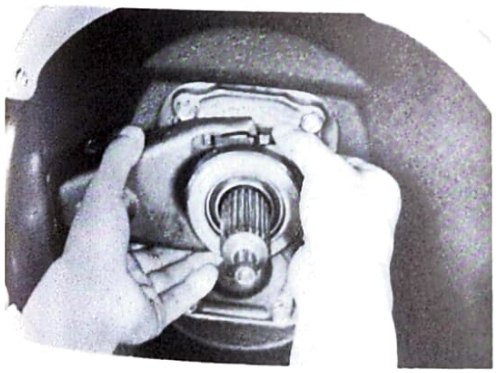
1. REMOVE TRANSMISSION (See page 9-12)

   NOTE: Do not drain the transmission oil.

2. REMOVE CLUTCH COVER AND DISC

   (a) Loosen the set bolts one turn at a time until the spring tension is released.

   (b) Remove the set bolts and pull off the clutch cover and disc.



3. REMOVE BEARING, HUB AND FORK FROM TRANSMISSION

   (a) Remove the retaining clip and pull off the bearing and hub.

   (b) Remove the fork and boot.

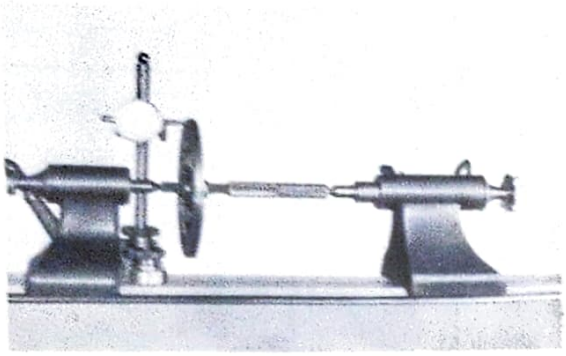
INSPECTION OF CLUTCH PARTS

1. INSPECT CLUTCH DISC FOR WEAR OR DAMAGE

   Using calipers, measure the rivet head depth.

   Minimum rivet depth: 0.3 mm (0.012 in.)

   If a problem is found, repair or replace the clutch disc.

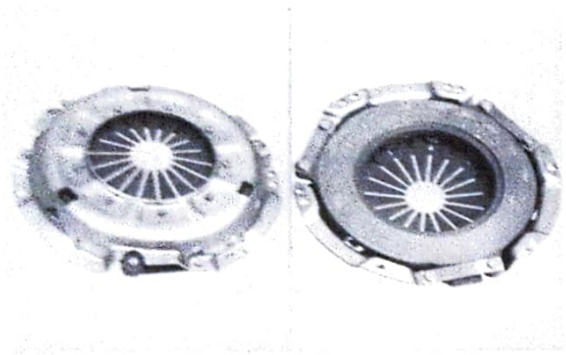


2. **INSPECT CLUTCH DISC RUNOUT**

Using a dial indicator, check the disc runout.

Maximum runout: 0.8 mm (0.031 in.)

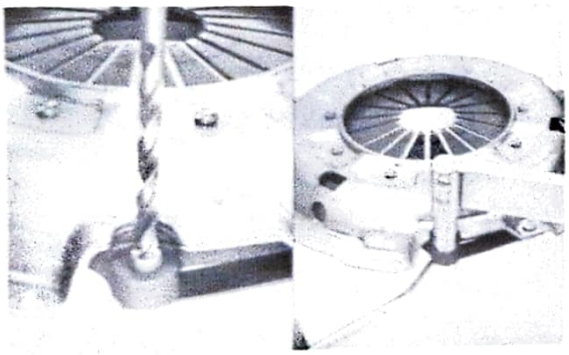
If runout is excessive, replace the disc.



3. **INSPECT CLUTCH COVER ASSEMBLY**

Check for wear or burning.

If only the pressure plate is worn, replace it.



4. **IF NECESSARY, REPLACE PRESSURE PLATE**

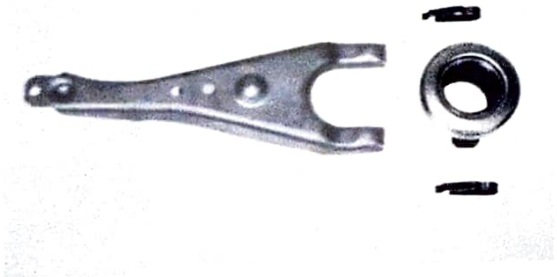
(a) Drill out the rivet heads.

(b) Using a punch, drive out the rivets.

(c) Install a new pressure plate with special pressure plate bolts and nuts.
Torque the nuts.

Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)

(d) Stake the nuts.

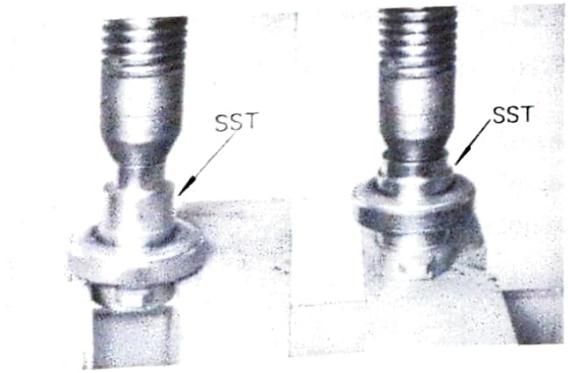


5. **INSPECT BEARING, HUB AND FORK**

Check for wear or damage.

NOTE: The bearing is permanently lubricated and requires no cleaning or lubrication.

If the bearing is rough or worn, replace it.



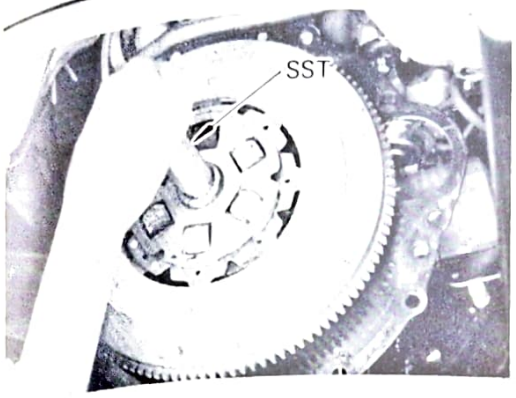
6. **IF NECESSARY, REPLACE RELEASE BEARING**

(a) Using a press and collar*, press the release bearing from the hub.

(b) Using a press and collar*, press a new release bearing into the hub.

*SST 09315-00010 or Commercial collar

7. **INSPECT PILOT BEARING AND FLYWHEEL**
(See page 4-36)

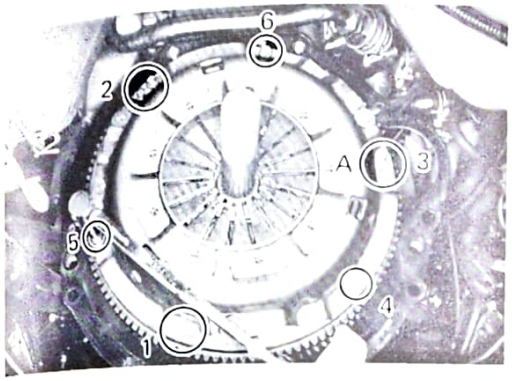


INSTALLATION OF CLUTCH UNIT

1. INSTALL DISC ON FLYWHEEL

Using a clutch guide tool*, install the disc on the flywheel.

*SST 09301-20020

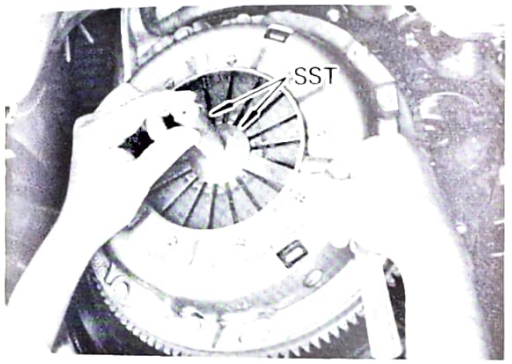


2. INSTALL CLUTCH COVER

(a) Half tighten bolt A near one of the three knock pins.

(b) Tighten the bolts in the numerical order shown. Torque the bolts.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



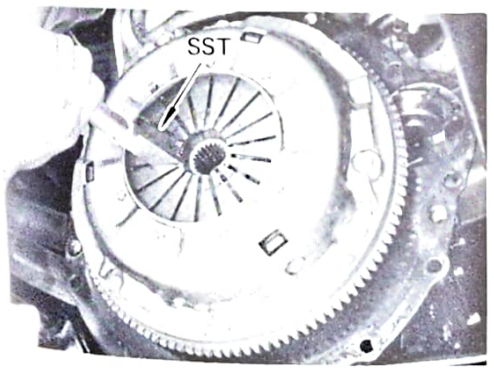
3. CHECK DIAPHRAGM SPRING TIP ALIGNMENT

Using a feeler gauge and measuring tool*, measure the gap between the spring tips and the tool.

*SST 09301-00012

Maximum gap: 0.5 mm (0.020 in.)

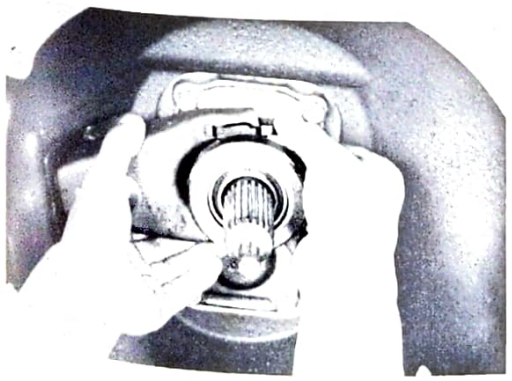
If gap is excessive, adjust as follows.



4. IF NECESSARY, ALIGN DIAPHRAGM SPRING

Using a diaphragm aligner*, bend the springs until alignment is correct.

*SST 09301-00012



5. INSTALL CLUTCH RELEASE BEARING AND FORK

(a) Apply multipurpose grease to the release bearing front.

(b) Apply molybdenum disulphide lithium base grease to the following parts.

- Clutch disc spline
- Release bearing hub inside
- Release fork and hub contact points
- Release fork pivot point
- Release fork and push rod contact point

(c) Install the release fork and bearing on the transmission.

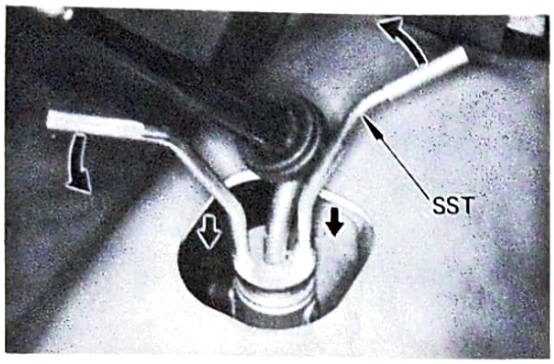
6. INSTALL TRANSMISSION (See page 9-53)

L45,48,52 TRANSMISSION

L45 4-Speed for RN4x4
L48 4-Speed for RN4x2
L52 5-Speed for RN4x4

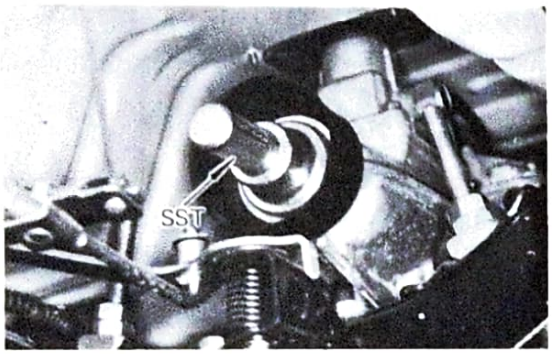
REMOVAL OF TRANSMISSION (RN4×2)

NOTE: For transmission (RN4x4), refer to REMOVAL OF TRANSFER on page 11-3.



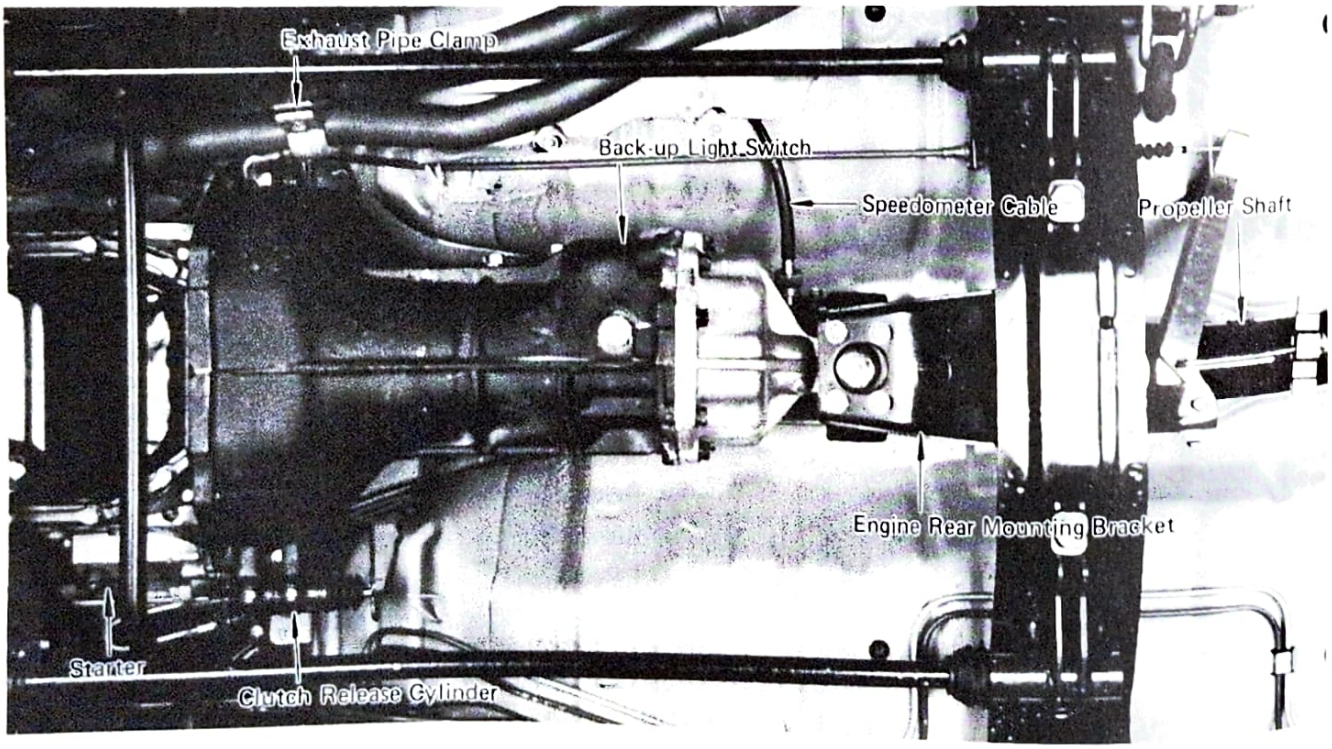
1. **REMOVE SHIFT LEVER FROM INSIDE OF VEHICLE**
   Using SST*, remove the shift lever from the transmission.
   *SST 09305-20012

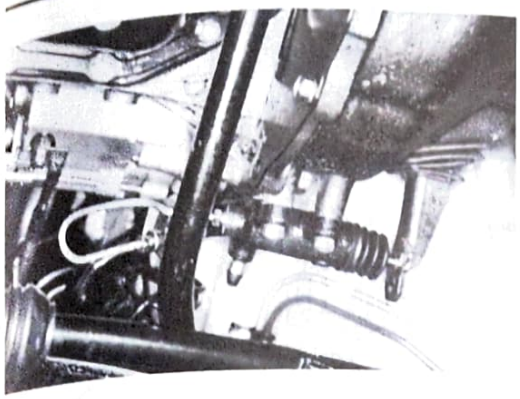
2. **REMOVE UPPER MOUNTING NUT FROM STARTER**



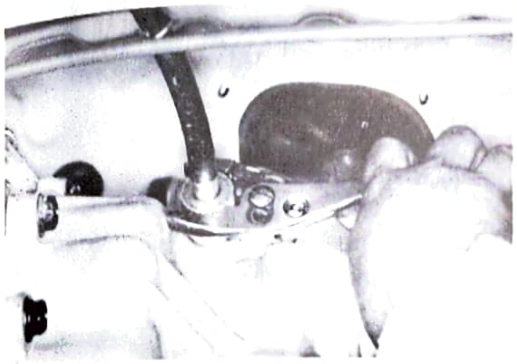
3. **RAISE VEHICLE AND DRAIN TRANSMISSION**
   CAUTION: Be sure the vehicle is securely supported.

4. **REMOVE PROPELLER SHAFT** (See page 12-3)
   Remove the propeller shaft and insert transmission oil plug* into the extension housing.
   *SST 09325-20010 or Commercial plug

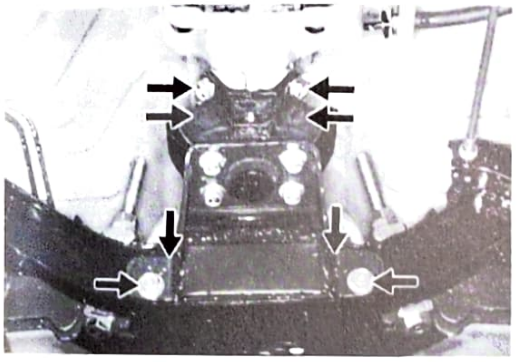




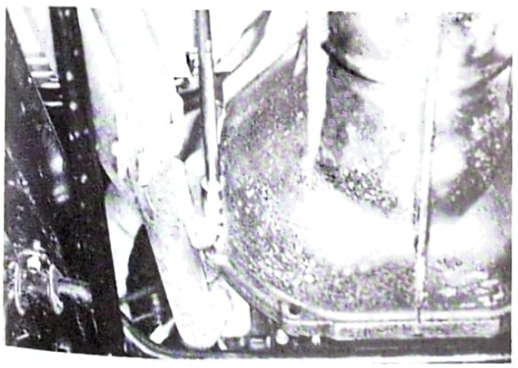
5. REMOVE CLUTCH RELEASE CYLINDER AND STARTER
   (a) Remove the release cylinder mounting bolts and the starter mounting bolt.
   (b) Lay the release cylinder and starter alongside the engine.



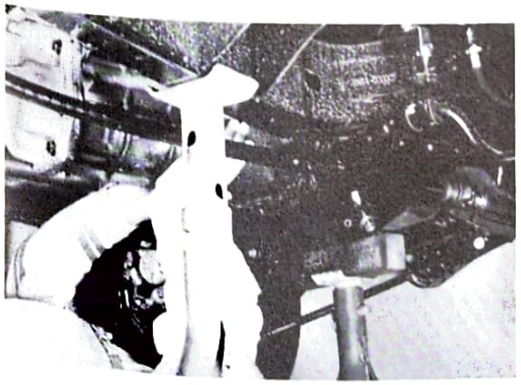
6. DISCONNECT SPEEDOMETER CABLE
7. DISCONNECT BACK-UP LIGHT SWITCH WIRE
8. DISCONNECT EXHAUST PIPE CLAMP FROM TRANSMISSION HOUSING



9. REMOVE ENGINE REAR MOUNTING WITH BRACKET
   (a) Remove the four mounting bolts from the extension housing.
   (b) Raise the transmission slightly by raising the engine with a jack and wooden block under the engine.
   (c) Remove the four bracket bolts from the support member and remove the rear mounting with bracket.



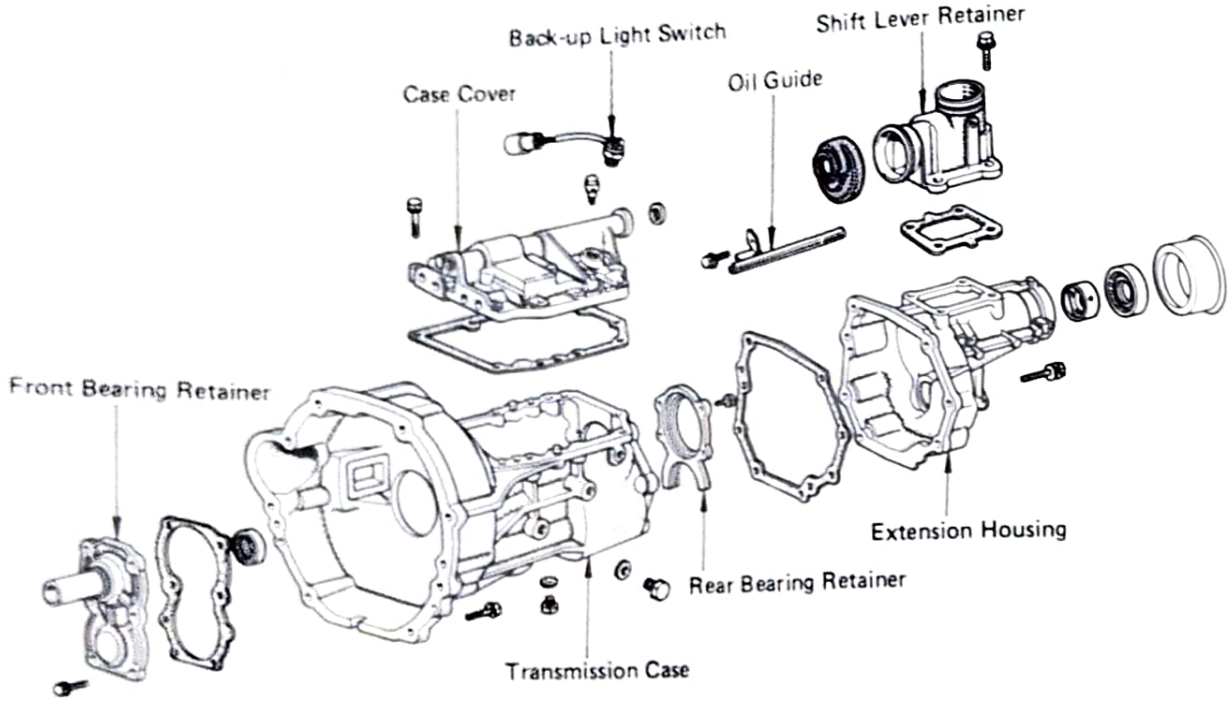
10. REMOVE REMAINING TRANSMISSION HOUSING BOLTS



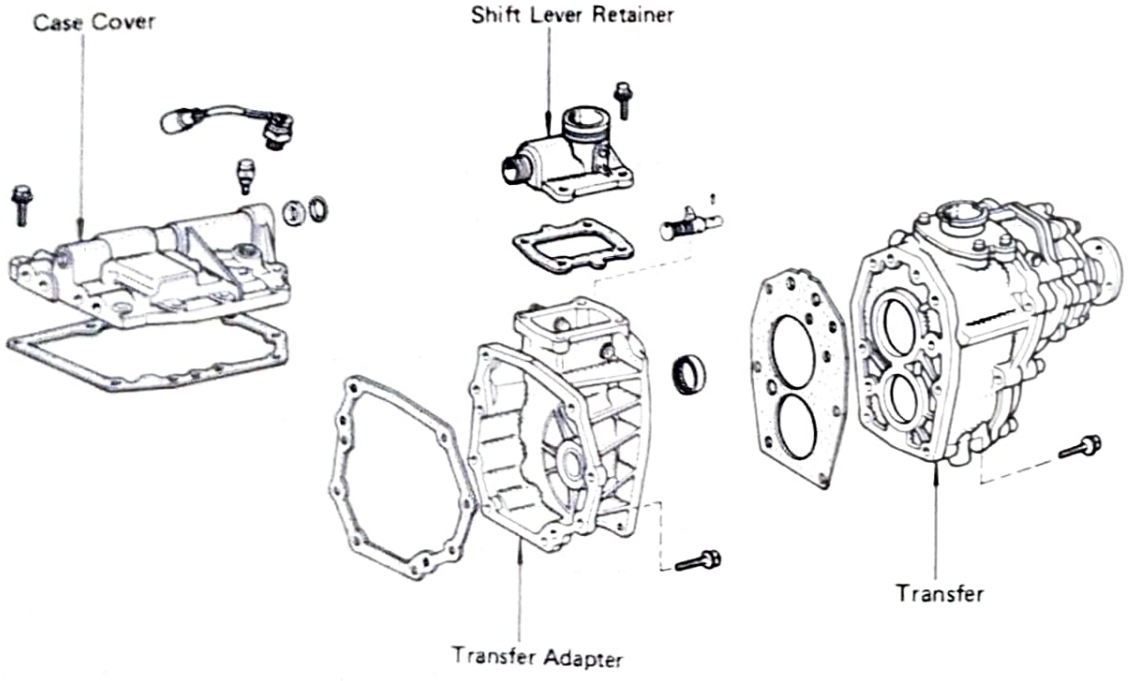
11. REMOVE TRANSMISSION ASSEMBLY
    (a) Draw out the transmission toward the rear.
    (b) Lower the transmission front and remove the transmission from the vehicle.

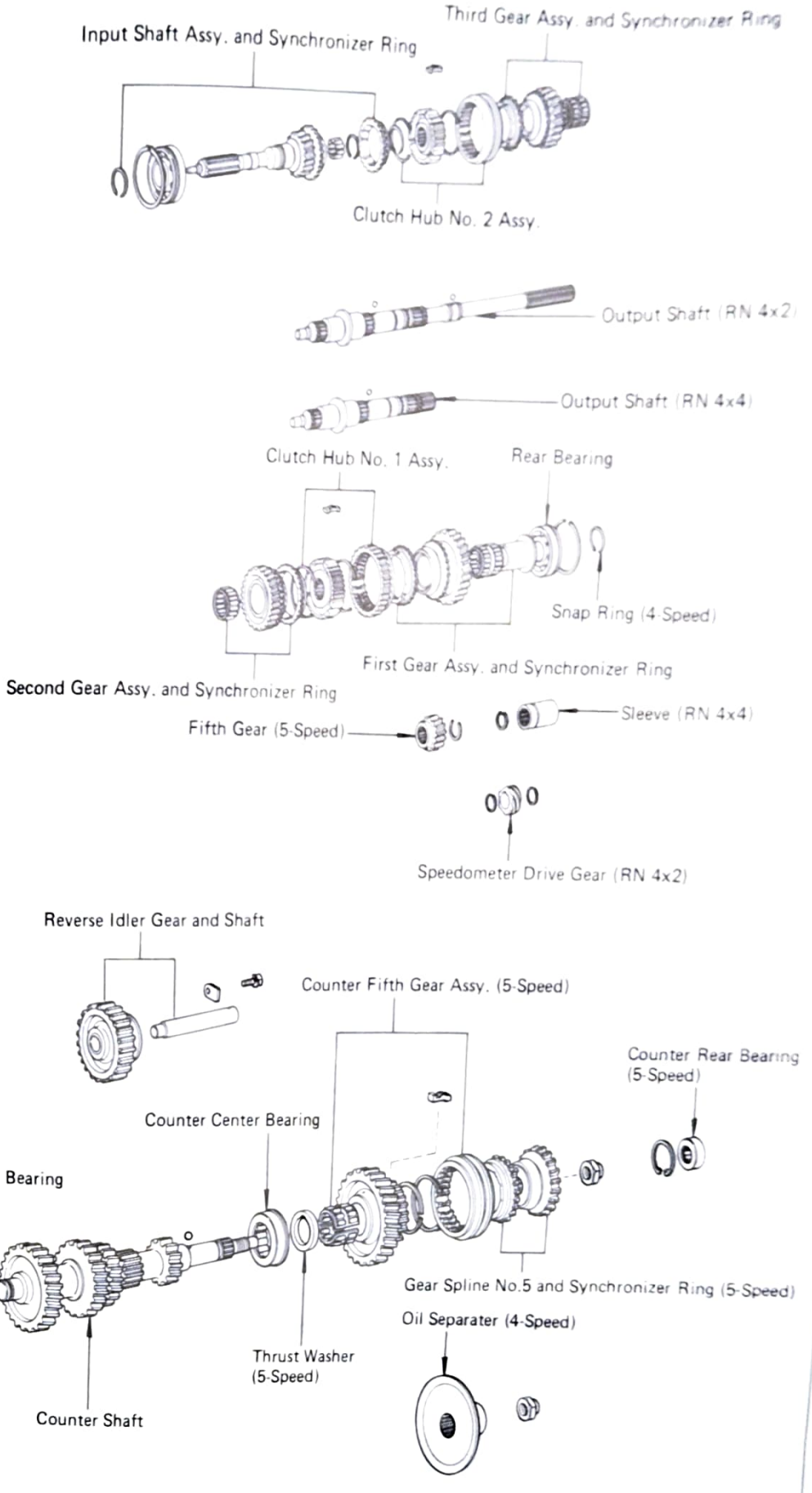
NOTE: Be careful not to damage the extension housing dust deflector.

[RN 4x2]

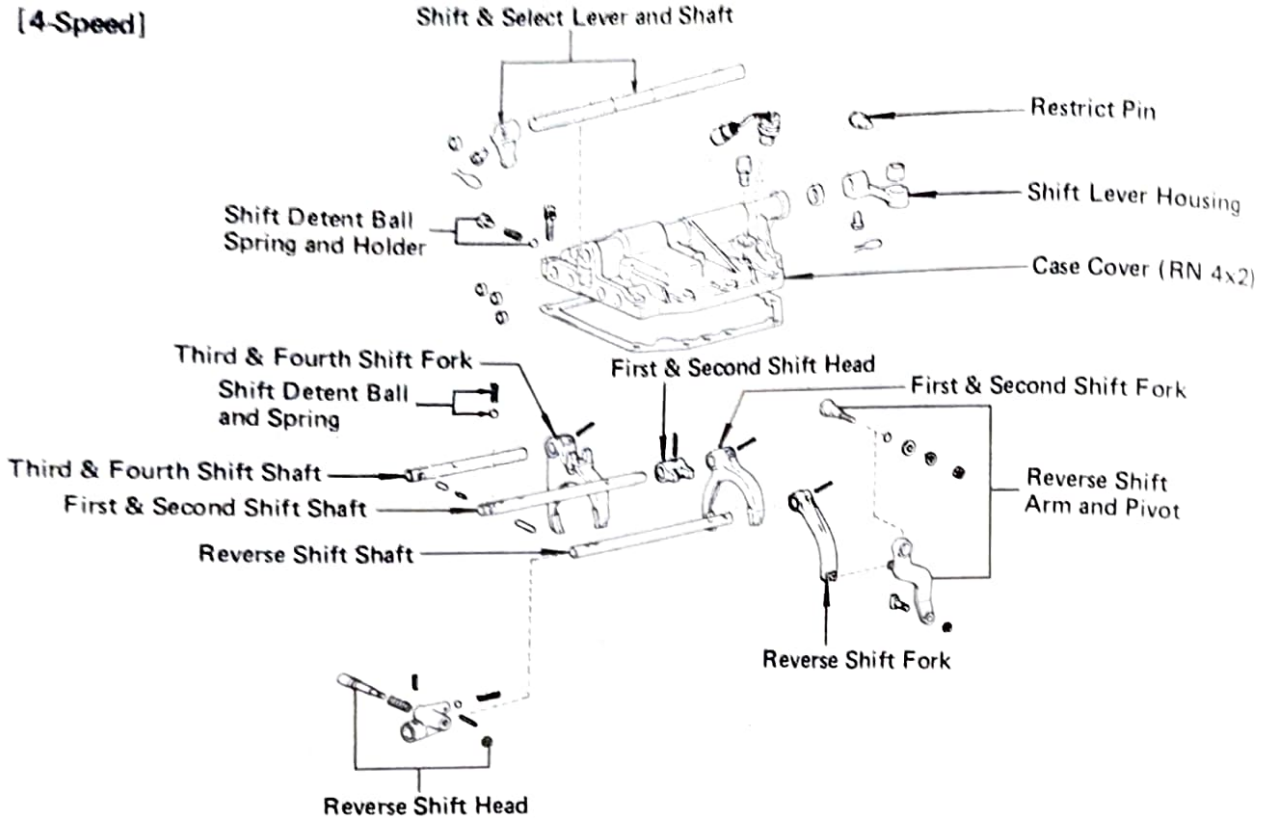

Back-up Light Switch
Shift Lever Retainer
Case Cover
Oil Guide
Front Bearing Retainer
Extension Housing
Rear Bearing Retainer
Transmission Case

[RN 4x4]

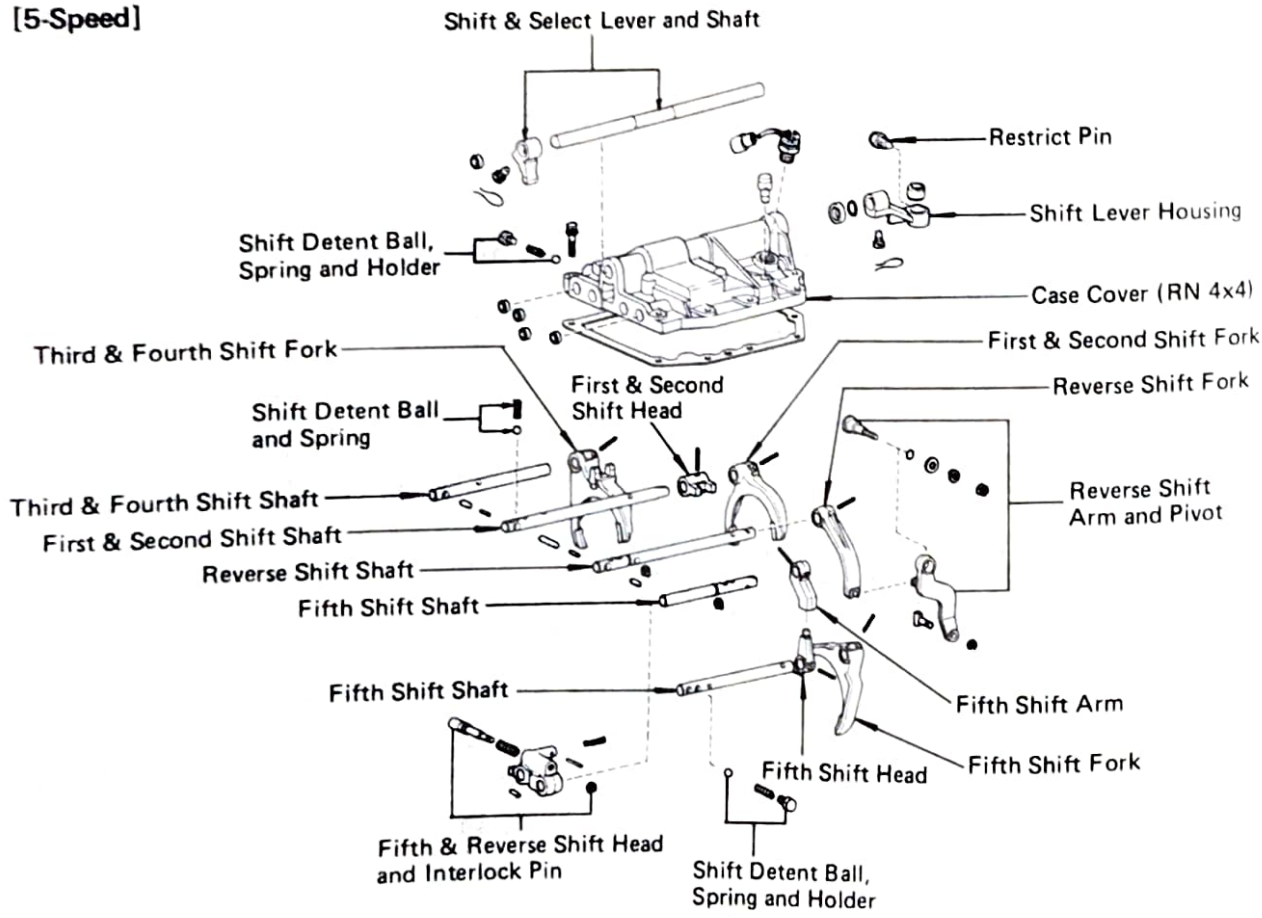

Case Cover
Shift Lever Retainer
Transfer
Transfer Adapter

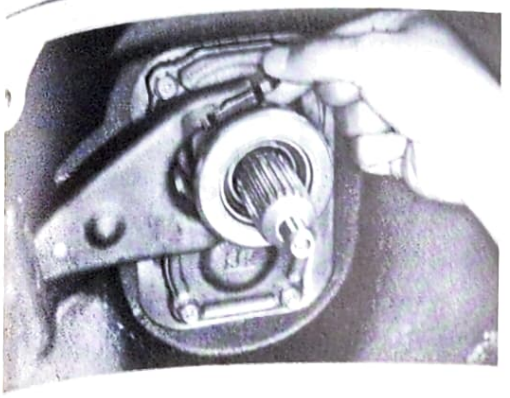

Third Gear Assy. and Synchronizer Ring
Input Shaft Assy. and Synchronizer Ring
Clutch Hub No. 2 Assy.
Output Shaft (RN 4x2)
Output Shaft (RN 4x4)
Clutch Hub No. 1 Assy.
Rear Bearing
Snap Ring (4-Speed)
First Gear Assy. and Synchronizer Ring
Second Gear Assy. and Synchronizer Ring
Fifth Gear (5-Speed)
Sleeve (RN 4x4)
Speedometer Drive Gear (RN 4x2)
Reverse Idler Gear and Shaft
Counter Fifth Gear Assy. (5-Speed)
Counter Rear Bearing (5-Speed)
Counter Center Bearing
Counter Front Bearing
Gear Spline No.5 and Synchronizer Ring (5-Speed)
Oil Separater (4-Speed)
Thrust Washer (5-Speed)
Counter Shaft

[4-Speed]



[5-Speed]





DISASSEMBLY OF TRANSMISSION

1. REMOVE CLUTCH RELEASE BEARING AND FORK

   (a) Remove the two clips and release bearing from the fork.

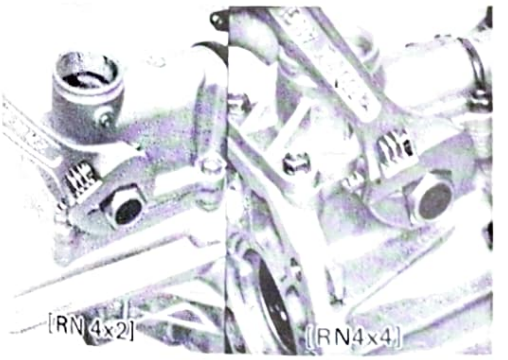
   (b) Pull the fork and remove it from the pivot.

2. REMOVE BACK-UP LIGHT SWITCH

   Using a back-up light switch tool*, remove the back-up light switch from the case cover.

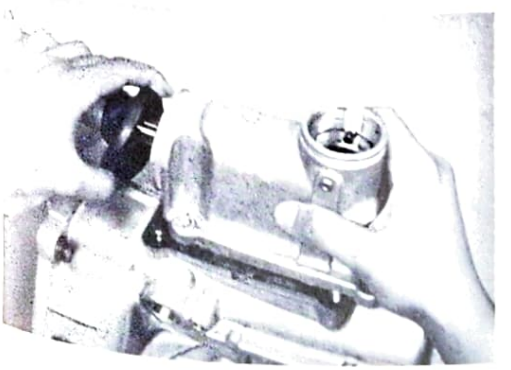
   *SST 09817-16010

3. REMOVE SPEEDOMETER DRIVEN GEAR (RN4x2)



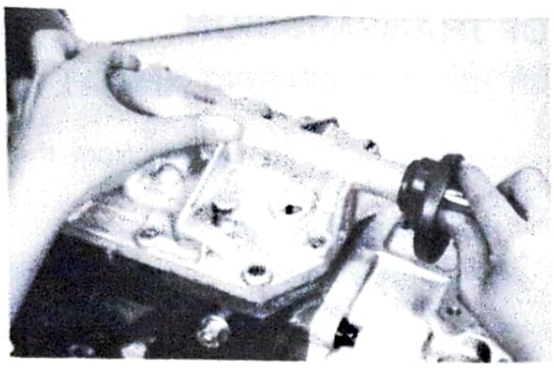
4. REMOVE RESTRICT PIN

   Remove the restrict pin from the shift lever retainer (RN4x2) or adapter (RN4x4).

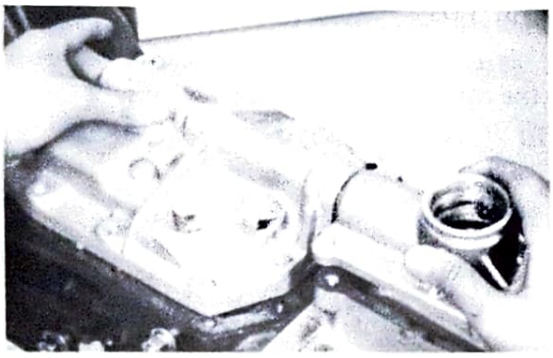


5. REMOVE SHIFT LEVER RETAINER AND CASE COVER (RN 4x2)

   (a) Remove the shift lever retainer from the extension housing.



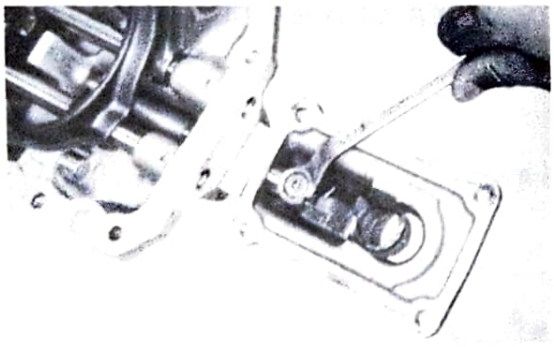
(b) Remove the transmission case cover from the case.



(RN 4x4)

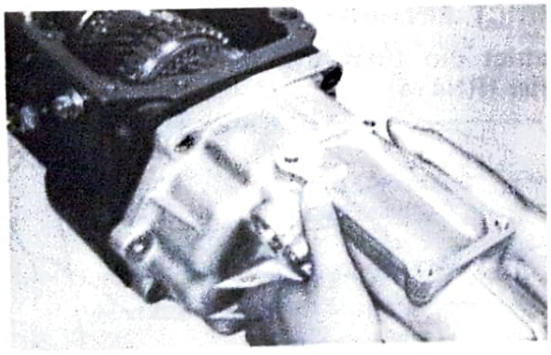
(a) Remove the transmission case cover and shift lever retainer mounting bolts.

(b) Remove the case cover together with the shift lever retainer.

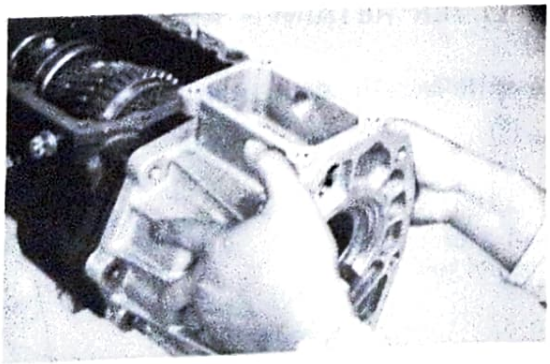


(c) Remove the lock wire and bolt from the shift lever housing.

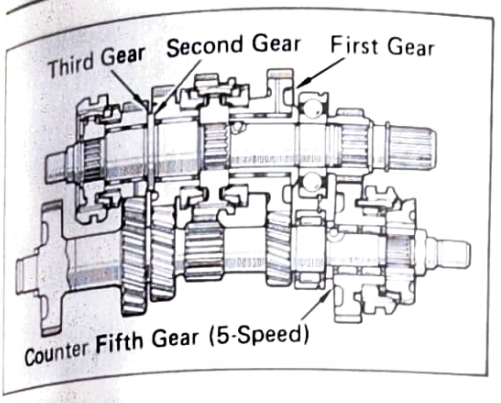
(d) Remove the shift lever housing and shift lever retainer.



6. REMOVE EXTENSION HOUSING (RN 4x2)



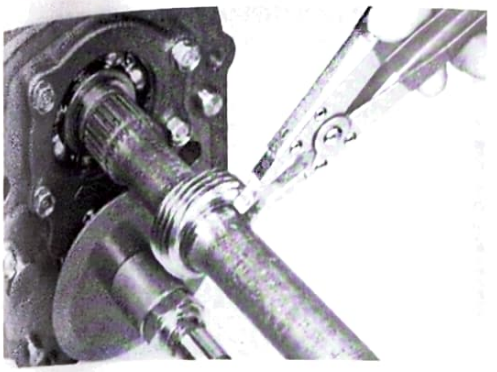
7. REMOVE TRANSFER ADAPTER (RN 4x4)



8. MEASURE THRUST CLEARANCE FOR EACH GEAR

Using a feeler gauge, measure the thrust clearance for each gear, and record the result for later reference.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)
Maximum clearance: 0.25 mm (0.0098 in.)

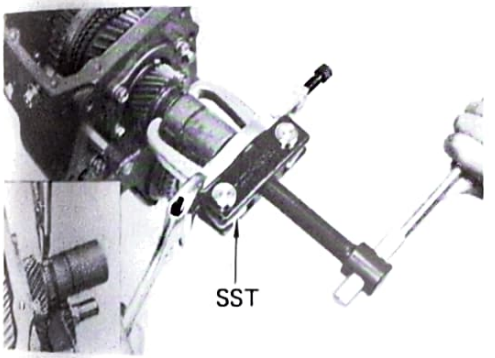


9. REMOVE SPEEDOMETER DRIVE GEAR (RN 4x2)

(a) Using snap ring pliers, remove the snap ring.

(b) Remove the speedometer drive gear and lock ball from the output shaft.

(c) Remove the other snap ring.



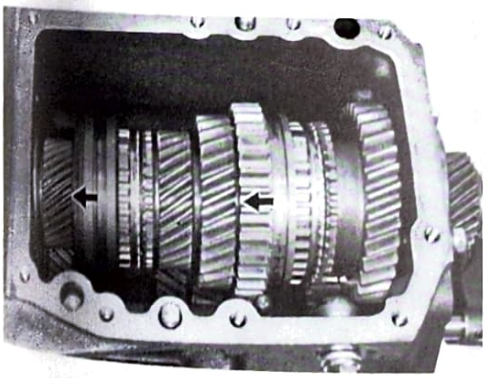
10. REMOVE SLEEVE FROM OUTPUT SHAFT (RN4x4)

(a) Using snap ring pliers, remove the snap ring from the groove.

(b) Using a universal puller*, remove the sleeve.

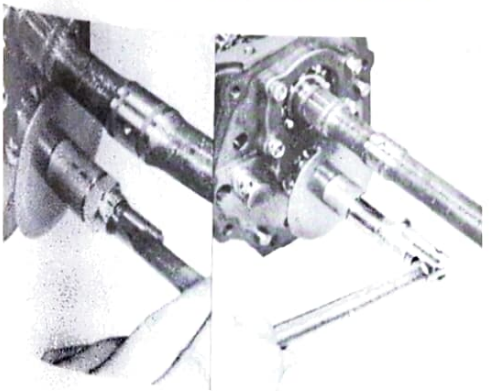
*SST 09950-20014

(c) Remove the snap ring stated in (a).



11. ENGAGE GEAR DOUBLE MESHING INTO SECOND AND THIRD

NOTE: Do not shift into first gear to avoid overshifting.



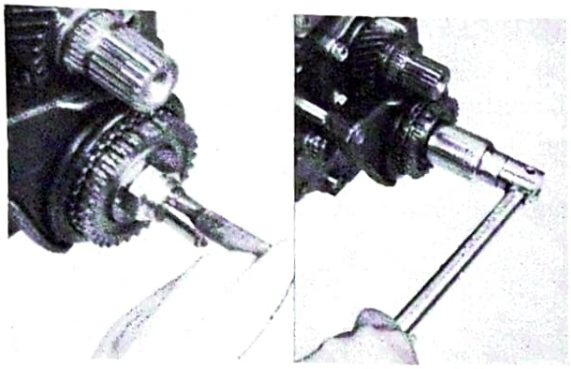
12. REMOVE COUNTERSHAFT LOCK NUT AND OIL SEPARATOR (4-Speed)

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using a socket wrench*, remove the lock nut.

*SST 09326-22011 or Commercial socket

(c) Remove the oil separator from the countershaft.

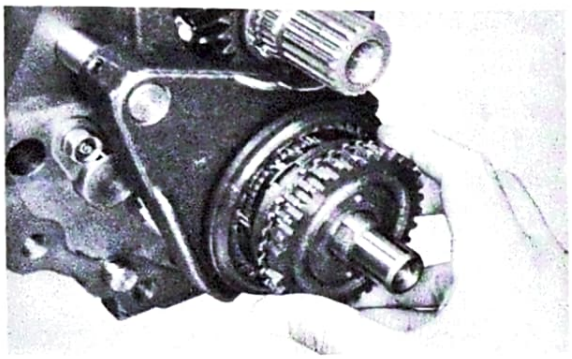


13. REMOVE COUNTERSHAFT LOCK NUT (5-Speed)

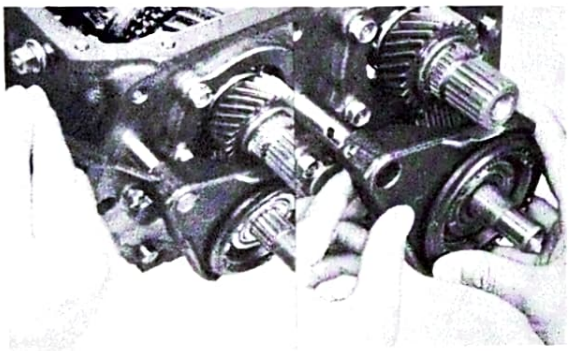
(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using a socket wrench*, remove the lock nut.

*SST 09326-22011 or Commercial socket



14. REMOVE GEAR SPLINE NO.5 AND SYNCHRONIZER RING FROM COUNTERSHAFT (5-Speed)

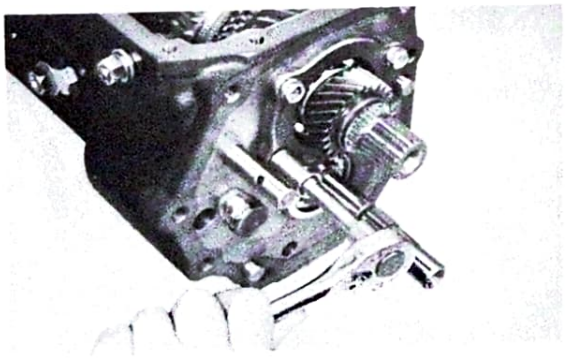


15. REMOVE COUNTERSHAFT FIFTH GEAR ASSEMBLY AND SHIFT FORK (5-Speed)

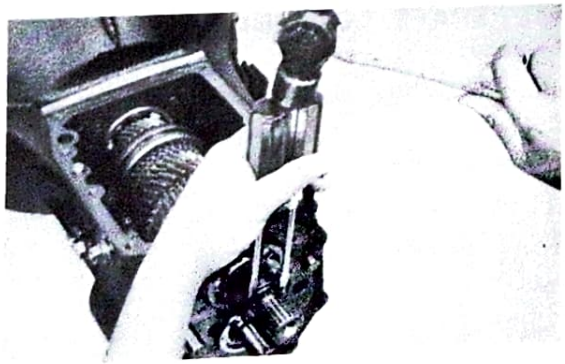
(a) Using a pin punch, drive out the slotted spring pin from the fork.

(b) Remove the shift fork, fifth gear, needle roller bearing and inner race together.

(c) Remove the lock ball from the countershaft.

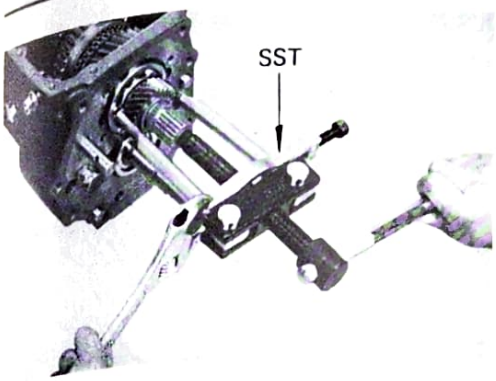


16. REMOVE REAR BEARING RETAINER



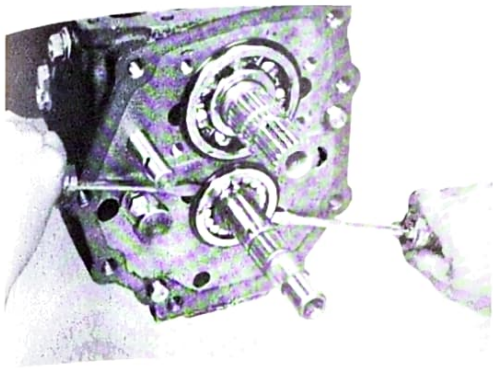
17. REMOVE FIFTH GEAR (5-Speed)

(a) Using two screwdrivers as shown, drive out the snap ring.



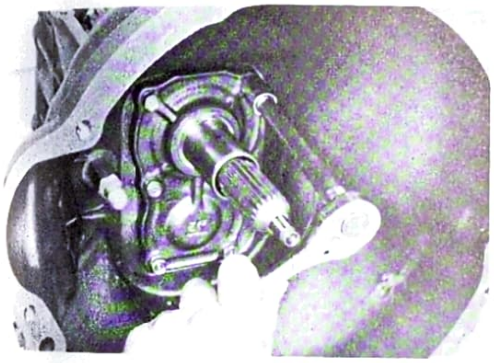
(b) Using a universal puller*, remove the fifth gear.

*SST 09950-20014

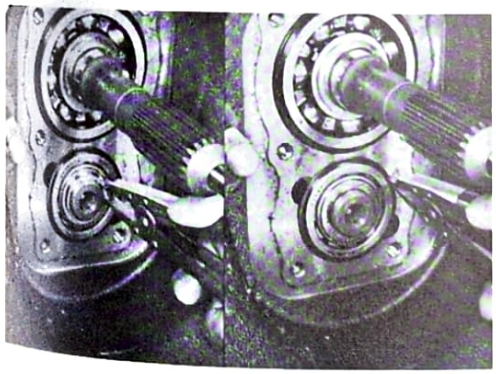


18. REMOVE COUNTERSHAFT CENTER BEARING

Using two screwdrivers as shown, pry out the center bearing.

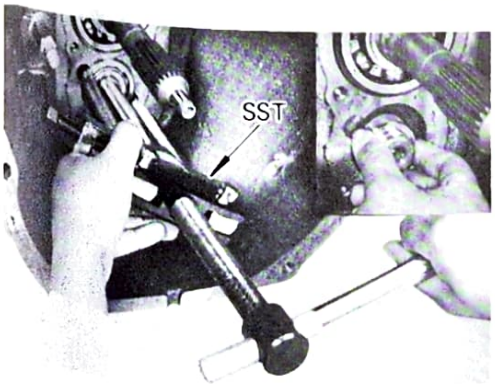


19. REMOVE FRONT BEARING RETAINER



20. REMOVE COUNTERSHAFT FRONT BEARING

(a) Using snap ring pliers, remove the two snap rings.

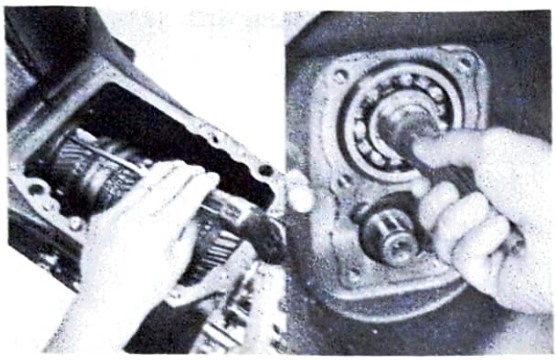


(b) Using a universal puller*, remove the countershaft front bearing.

*SST 09950-20014

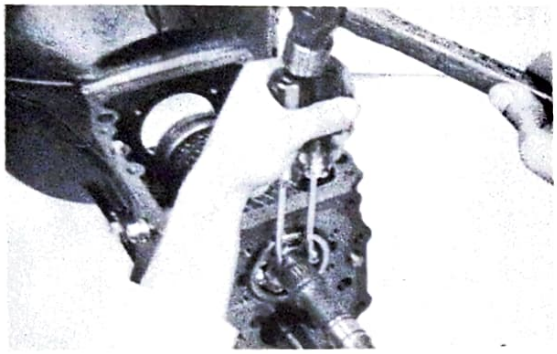
NOTE: The bearing spacer may be stuck to the countershaft, so remove it after removing the bearing.

Lay the countershaft on the bottom of the case.



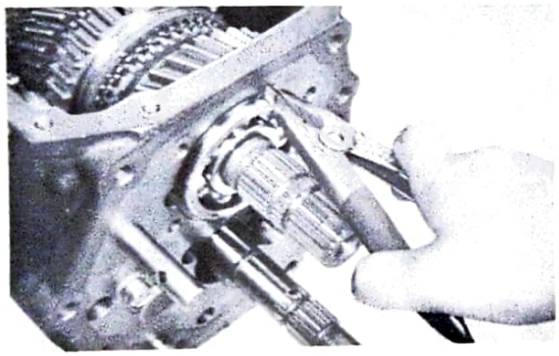
21. REMOVE INPUT SHAFT

Using a screwdriver and hammer, tap the bearing outer race and remove the input shaft with the synchronizer ring.

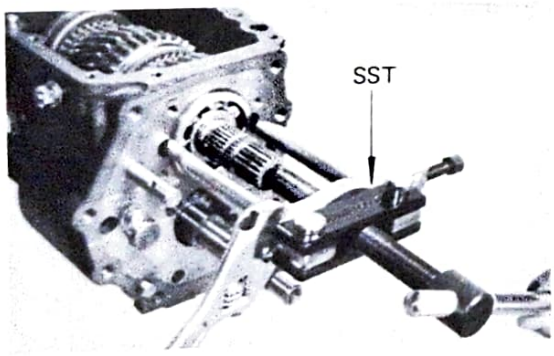


22. REMOVE OUTPUT SHAFT REAR BEARING

(a) Using snap ring pliers, remove the small snap ring. (4-Speed)

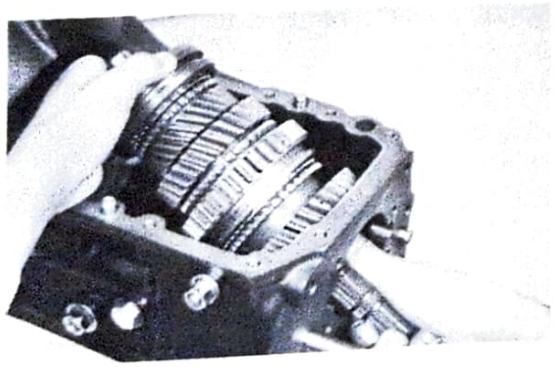


(b) Using snap ring pliers, remove the large snap ring.



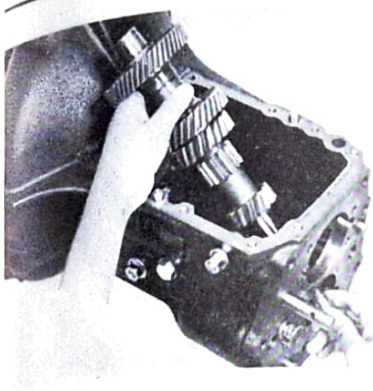
(c) Using a universal puller*, remove the output shaft rear bearing.

*SST 09950-20014

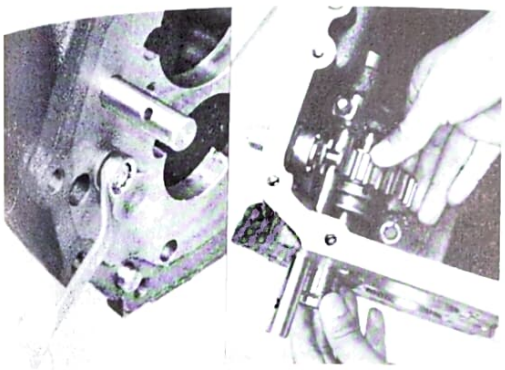


23. REMOVE OUTPUT SHAFT WITH GEARS

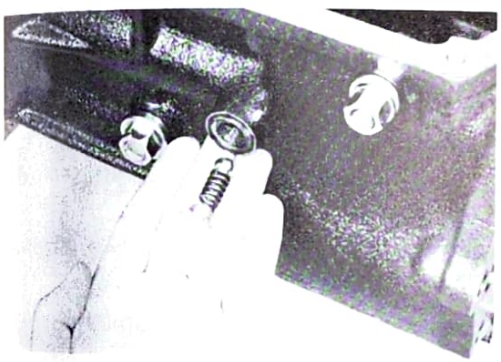
While holding the first gear and bearing inner race, remove the output shaft with the gears from the case.



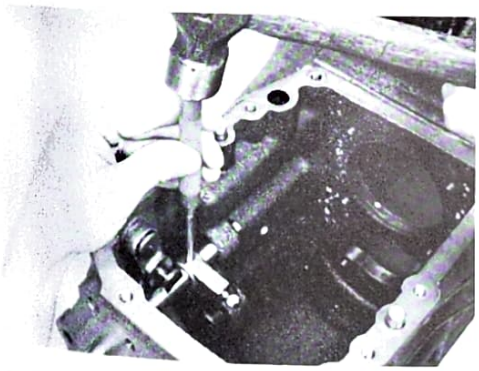
24. REMOVE COUNTERSHAFT FROM CASE



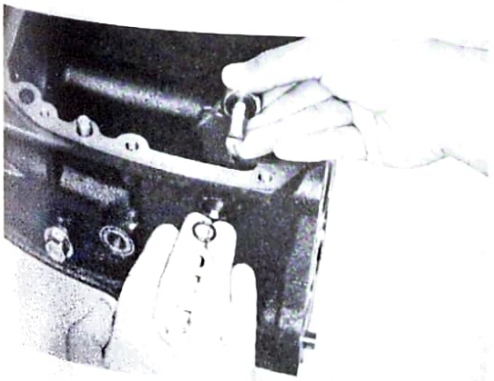
25. REMOVE REVERSE IDLER GEAR AND SHAFT
   (a) Remove the lock plate from the shaft.
   (b) Hold the reverse idler gear and slide out the shaft.



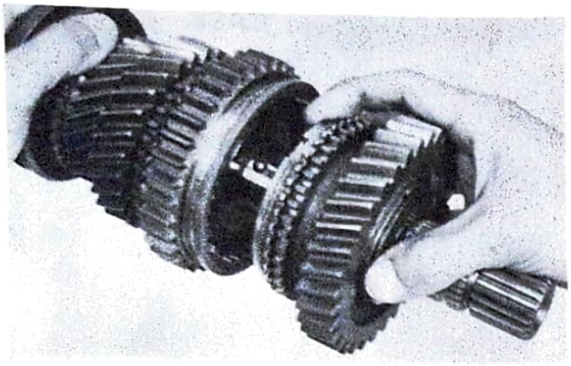
26. REMOVE FIFTH GEAR SHIFT HEAD AND FORK SHAFT (5-Speed)
   (a) Remove the shift detent ball holder, spring and ball from the transmission case.



   (b) Using a pin punch, drive out the slotted spring pin from the shift head.
   (c) Hold the shift head and pull out the shaft.



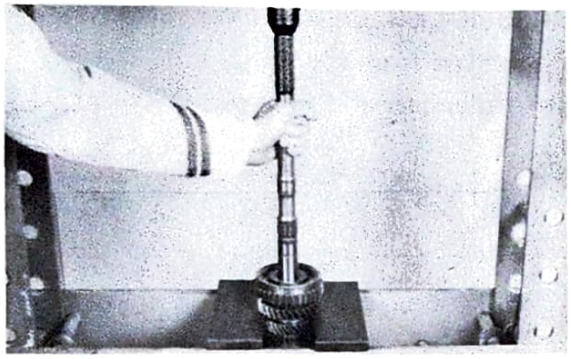
27. REMOVE REVERSE SHIFT ARM
   (a) Remove the reverse shift arm pivot lock nut, spring washer, plate washer and O-ring.
   (b) Remove the pivot and shift arm from the case.



28. REMOVE FIRST GEAR ASSEMBLY AND SYNCHRONIZER RING

(a) Pull out the first gear together with the needle roller bearings, inner race and synchronizer ring.

(b) Remove the lock ball from the output shaft.

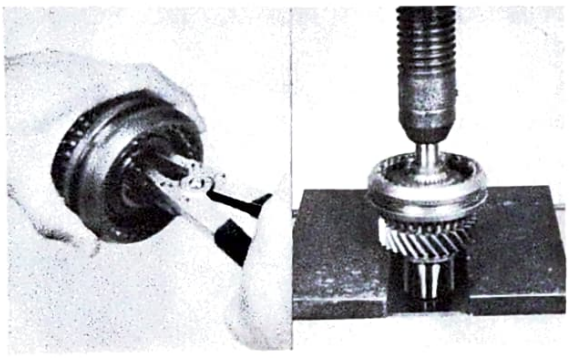


29. REMOVE CLUTCH HUB No. 1 ASSEMBLY, SYNCHRONIZER RING AND SECOND GEAR

(a) Support the second gear and press out the clutch hub No. 1 assembly, synchronizer ring and second gear with a press.

NOTE: Support the shaft by hand to prevent it from dropping down when the splines clear the hub.

(b) Remove the needle roller bearing from the output shaft.



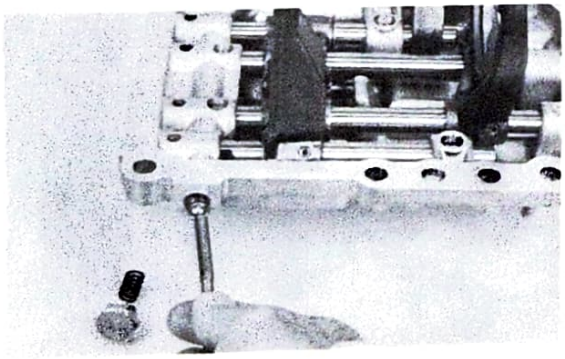
30. REMOVE CLUTCH HUB NO. 2 ASSEMBLY, SYNCHRONIZER RING AND THIRD GEAR

(a) Using snap ring pliers, remove the snap ring.

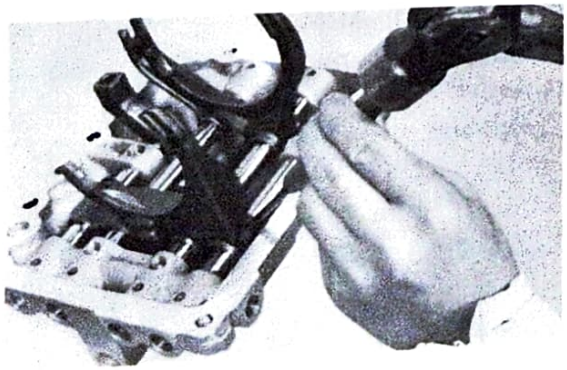
(b) Support the third gear and press out the clutch hub No. 2 assembly, synchronizer ring and third gear with a press.

NOTE: Support the shaft by hand so as to prevent it from dropping down when splines clear the hub.

(c) Remove the needle roller bearings from the output shaft.

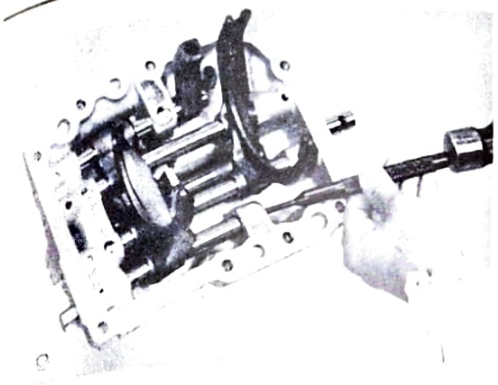


31. REMOVE SHIFT DETENT BALL HOLDER, SPRING AND BALL

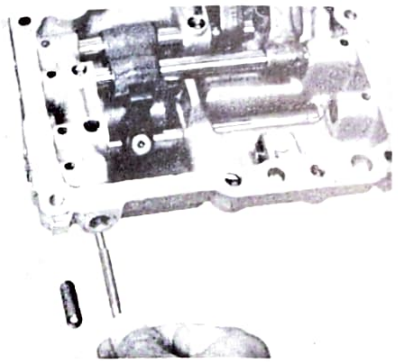


32. REMOVE THIRD & FOURTH SHIFT FORK SHAFT AND FORK

(a) Using a pin punch, drive out the slotted spring pin from the fork.



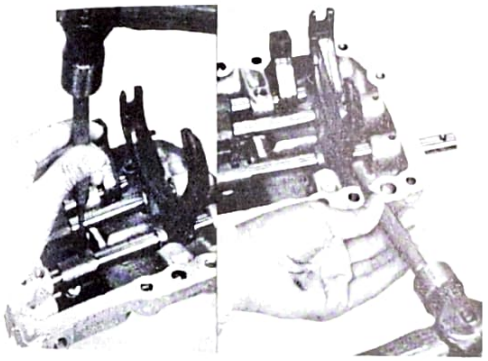
(b) Drive out the fork shaft together with the blind plug, and remove the fork.



33. REMOVE TWO INTERLOCK PINS

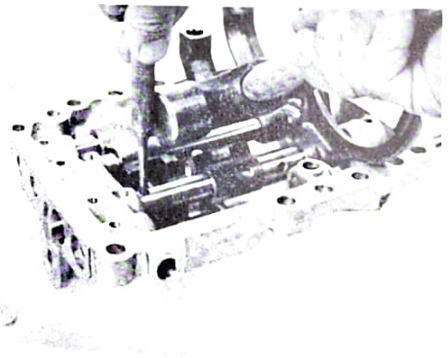
Using a magnet, remove the large and small interlock pins.

NOTE: The small interlock pin is in the fork shaft.

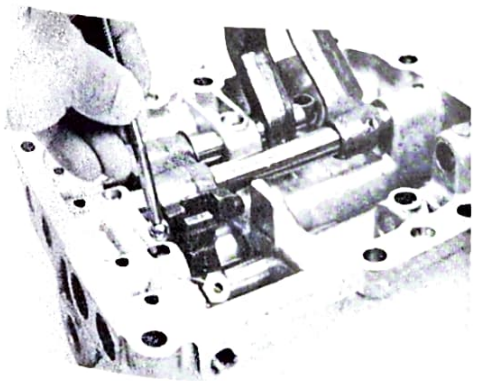


34. REMOVE FIRST & SECOND SHIFT FORK SHAFT, SHIFT HEAD AND FORK

(a) Using a pin punch, drive out the slotted spring pins from the shift head and fork.

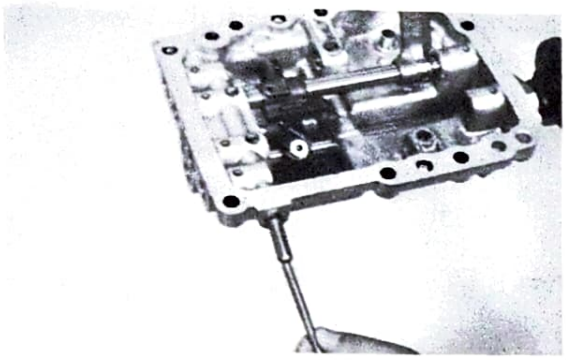


(b) Drive out the shift fork shaft together with the blind plug and remove the shift head and fork.



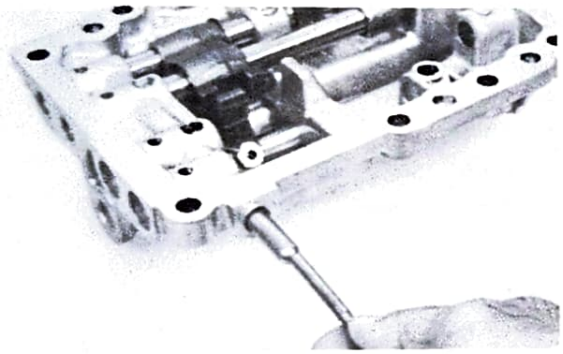
35. REMOVE SHIFT DETENT BALL AND SPRING

Using a magnet, remove the ball and spring from the hole.



36. REMOVE INTERLOCK PIN (4-Speed)

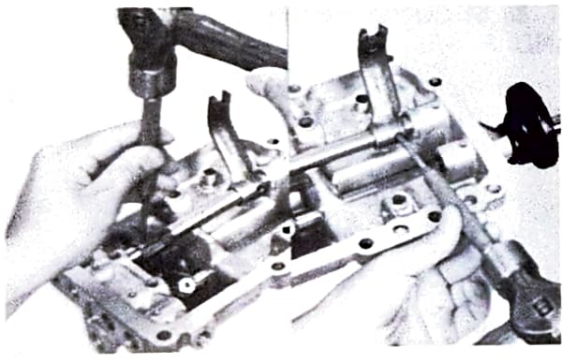
Using a magnet, remove the interlock pin.



37. REMOVE TWO INTERLOCK PINS (5-Speed)

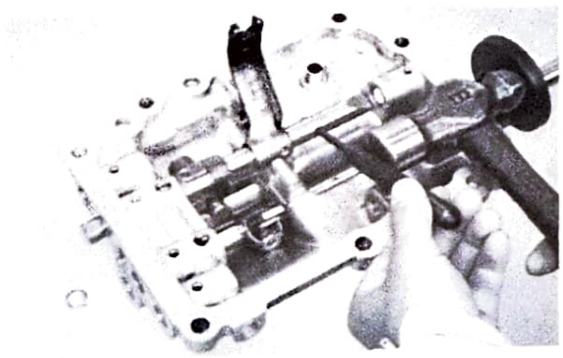
Using a magnet, remove the large and small interlock pins.

NOTE: The small interlock pin is in the fork shaft.

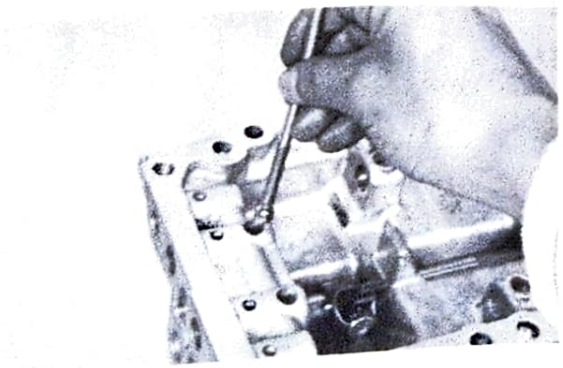


38. REMOVE REVERSE SHIFT FORK SHAFT, FORK AND HEAD (4-Speed)

(a) Using a pin punch, drive out the slotted spring pins from the reverse shift fork and head.

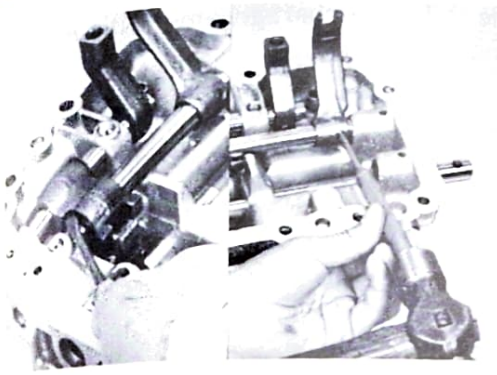


(b) Drive out the shift fork shaft together with the blind plug and remove the reverse shift fork and head.



39. REMOVE SHIFT DETENT BALL AND SPRING (4-Speed)

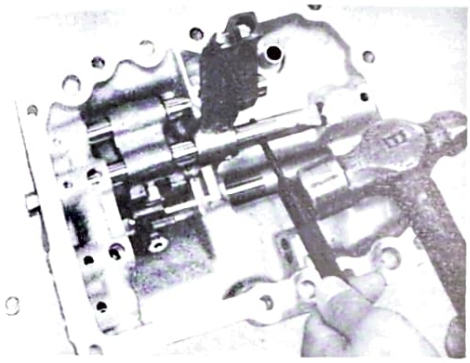
Using a magnet, remove the ball and spring.



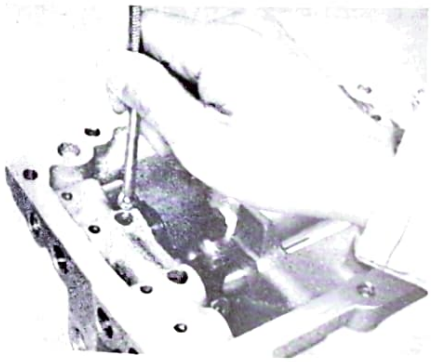
40. REMOVE REVERSE SHIFT FORK SHAFT AND FORK (5-Speed)

(a) Using a screwdriver, pry out the E-ring from the fifth & reverse shift head.

(b) Using a pin punch, drive out the slotted spring pin from the reverse shift fork.

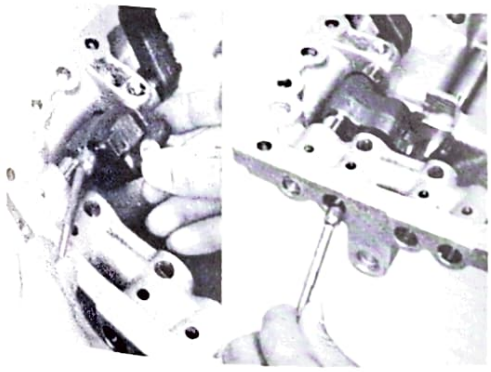


(c) Drive out the shift fork shaft together with the blind plug and remove the reverse shift fork.



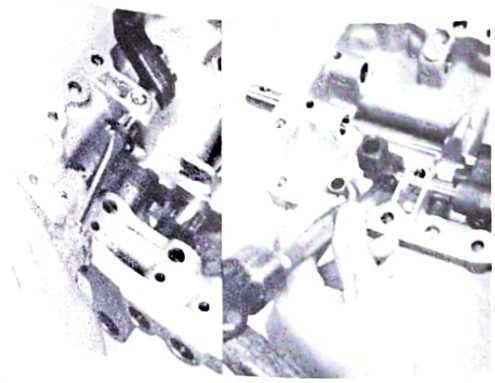
41. REMOVE SHIFT DETENT BALL AND SPRING (5-Speed)

Using a magnet, remove the ball and spring from the hole.



42. REMOVE TWO INTERLOCK PINS (5-Speed)

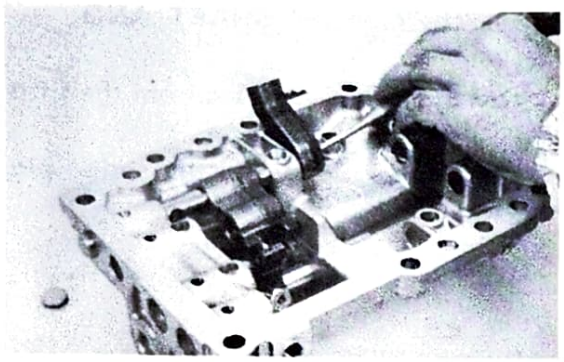
Using a magnet, remove the two interlock pins from the fifth & reverse shift head and case cover.



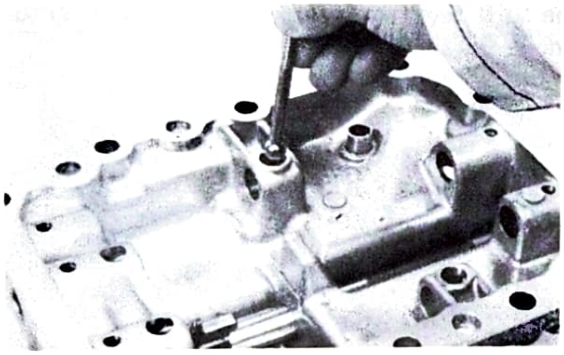
43. REMOVE FIFTH SHIFT FORK SHAFT, FIFTH & REVERSE SHIFT HEAD AND FIFTH SHIFT ARM (5-Speed)

(a) Using a screwdriver, pry out the E-ring from the fifth and reverse shift head.

(b) Using a pin punch, drive out the slotted spring pin from the fifth shift arm.

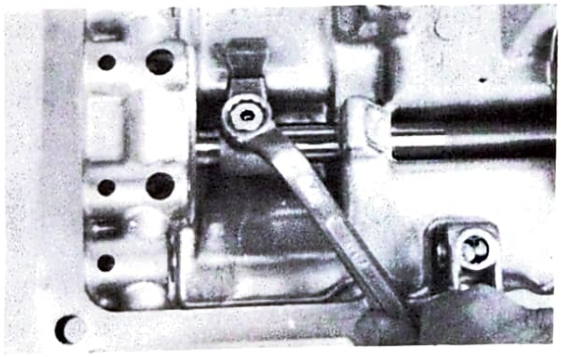


(c) Drive out the shift fork shaft together with the blind plug and remove the shift head and shift arm.



44. REMOVE SHIFT DETENT BALL AND SPRING (5-Speed)

Using a magnet, remove the ball and spring from the hole.



45. REMOVE SHIFT & SELECT LEVER AND SHAFT

(a) Remove the lock wire and bolt from the lever.

(b) Pull out the shaft from the case cover.

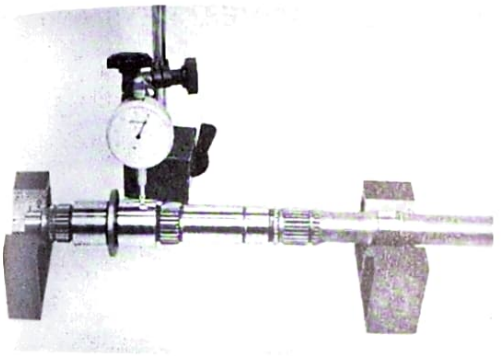
INSPECTION OF TRANSMISSION COMPONENTS

1. INSPECT OUTPUT SHAFT

(a) Inspect the bearing contact surface for wear or damage.

(b) Using calipers, measure the output shaft flange thickness.

Minimum thickness: 4.90 mm (0.1929 in.)



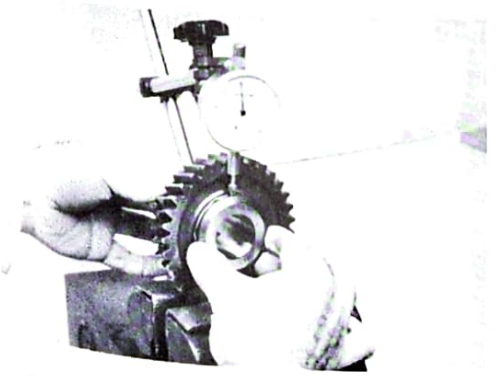
(c) Using a dial indicator, check the shaft runout.

Maximum runout: 0.05 mm (0.0020 in.)

If a problem is found, replace the shaft.

2. INSPECT GEARS AND NEEDLE ROLLER BEARINGS

Check for wear or damage.

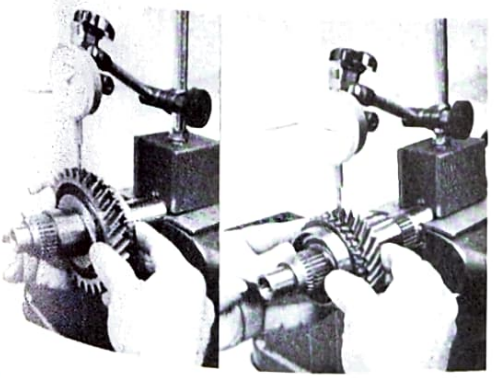


3. CHECK OIL CLEARANCE OF FIRST GEAR

Using a dial indicator, measure the oil clearance between the gear and inner race with the needle roller bearing installed.

Standard clearance: 0.009 – 0.032 mm (0.0004 – 0.0013 in.)

Maximum clearance: 0.032 mm (0.0013 in.)



4. CHECK OIL CLEARANCE OF SECOND, THIRD AND COUNTERSHAFT FIFTH GEAR

Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

Standard clearance:

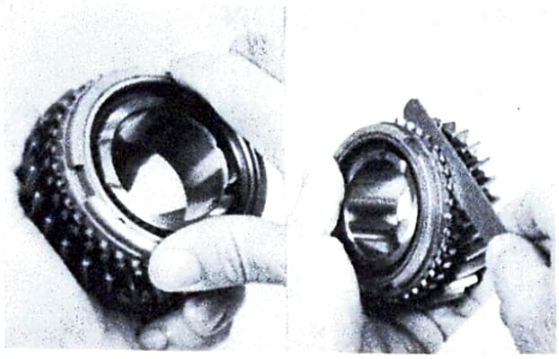
Second and third gears 0.0090 – 0.0325 mm (0.0004 – 0.0013 in.)

Countershaft fifth gear 0.009 – 0.032 mm (0.0004 – 0.0013 in.)

Maximum clearance:

Second and third gears 0.0325 mm (0.0013 in.)

Countershaft fifth gear 0.032 mm (0.0013 in.)



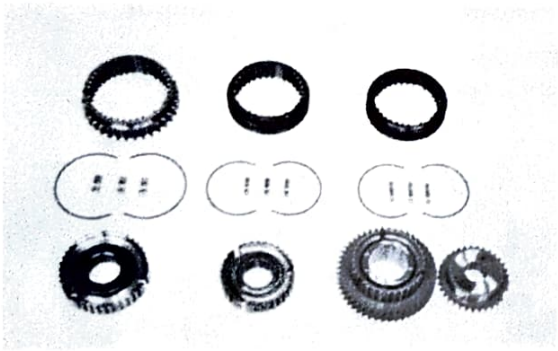
5. **INSPECT SYNCHRONIZER RINGS**

(a) Check the synchronizer rings for wear or damage.

(b) Turn the ring and push it in to check the braking action.

(c) Measure the clearance between the synchronizer ring back and the gear spline end.

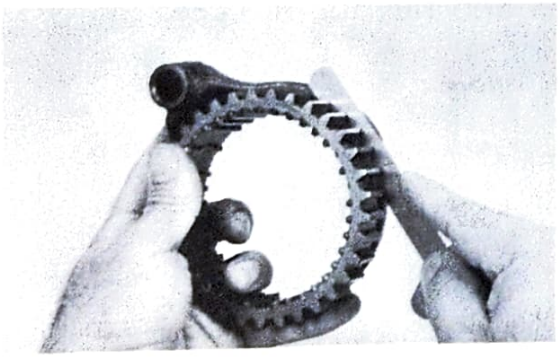
Minimum clearance: 0.8 mm (0.031 in.)



6. **INSPECT CLUTCH HUBS, SLEEVES, KEYS AND KEY SPRINGS**

(a) Check parts for wear or damage.

(b) Check the rounded part of the keys for wear or damage.



7. **INSPECT SHIFT FORK AND HUB SLEEVE**

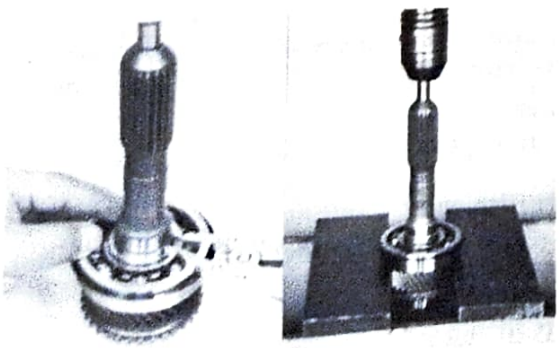
(a) Check the contact surfaces for wear or damage.

(b) Measure the clearance between the hub sleeve and the shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

8. **INSPECT INPUT SHAFT AND BEARING**

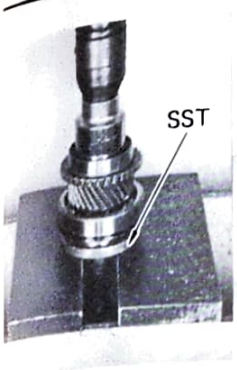
Check the shaft and bearing for wear or damage.
If the bearing is worn or damaged, replace it.

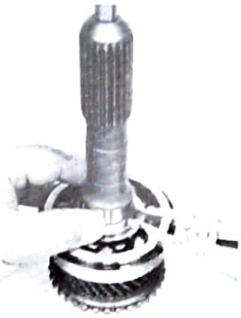


9. **IF NECESSARY, REPLACE INPUT SHAFT BEARING**

(a) Using snap ring pliers, remove the snap ring.

(b) Using a press, remove the bearing.





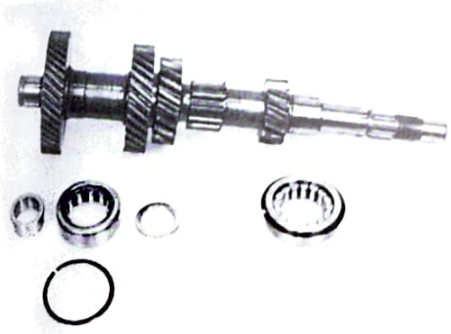
(c) Using a press and collar*, install a new bearing.

*SST 09506-30011 or Commercial collar

(d) Select a snap ring which will allow 0 – 0.10 mm (0 – 0.0039 in.) axial play and install it on the shaft.

Snap ring thickness

Mark	Part No.	Thickness mm (in.)
0	90520-30214	2.05 – 2.10 (0.0807 – 0.0827)
1	90520-30215	2.10 – 2.15 (0.0827 – 0.0846)
2	90520-30216	2.15 – 2.20 (0.0846 – 0.0866)
3	90520-30217	2.20 – 2.25 (0.0866 – 0.0886)
4	90520-30218	2.25 – 2.30 (0.0886 – 0.0906)
5	90520-30219	2.30 – 2.35 (0.0906 – 0.0925)

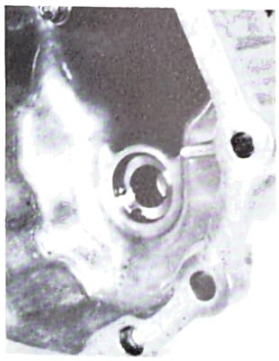


10. INSPECT COUNTERSHAFT AND BEARINGS

(a) Check the gears for wear or damage.

(b) Check the bearing contact surface for wear or damage.

(c) Check the front and center bearings for wear or damage.



(d) Check the rear bearing in the extension housing for wear or damage.

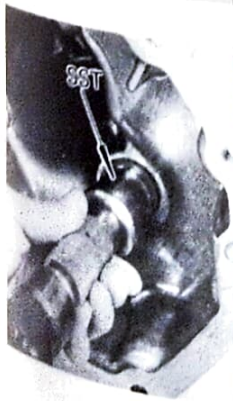
If the bearing is worn or damaged, replace it.

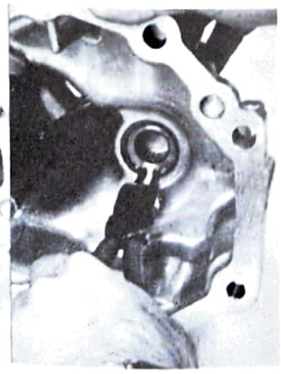
11. IF NECESSARY, REPLACE COUNTERSHAFT REAR BEARING

(a) Using snap ring pliers, remove the snap ring.

(b) Using a bearing puller*, remove the bearing.

*SST 09310-36021

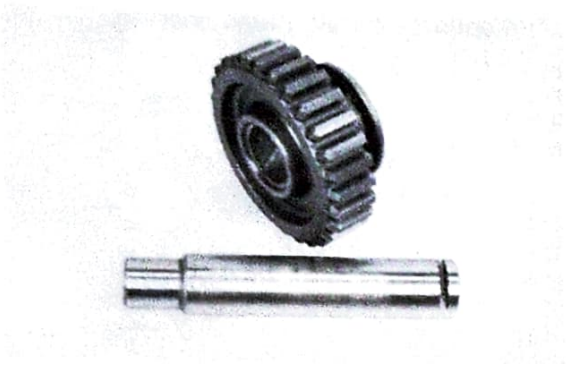




(c) Using a driver*, drive in the new bearing.

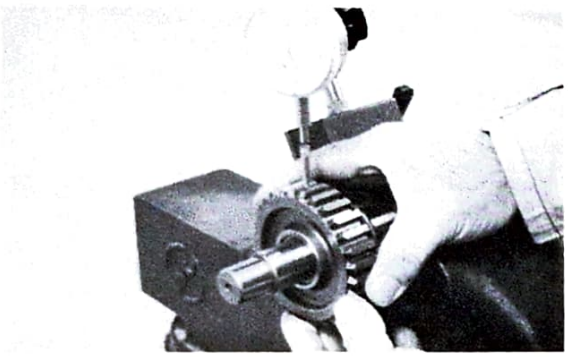
*SST 09307-30010 or Commercial driver

(d) Install the snap ring.



12. INSPECT REVERSE IDLER GEAR

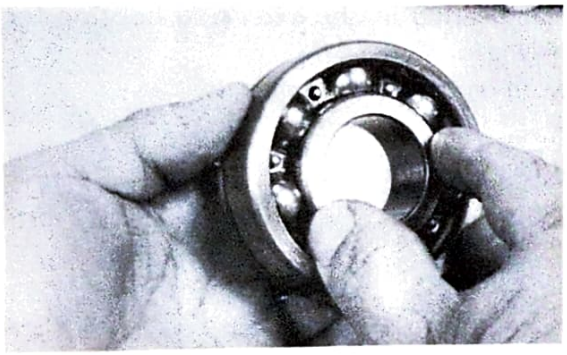
(a) Check the idler gear and shaft for wear or damage.



(b) Using a dial indicator, measure the oil clearance between the idler gear and shaft.

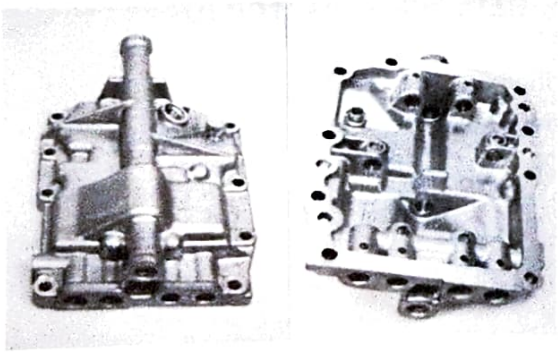
Standard clearance : **0.040 – 0.082 mm (0.0016 – 0.0032 in.)**

Maximum clearance : **0.082 mm (0.0032 in.)**



13. INSPECT OUTPUT SHAFT REAR BEARING

Check the bearing for wear or damage.

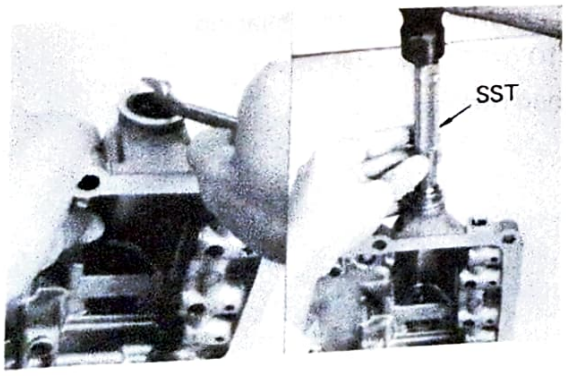


14. INSPECT CASE COVER

(a) Check the case cover for damage or cracks.

(b) Check the oil seal for wear or damage.

If the oil seal is worn or damaged, replace it.

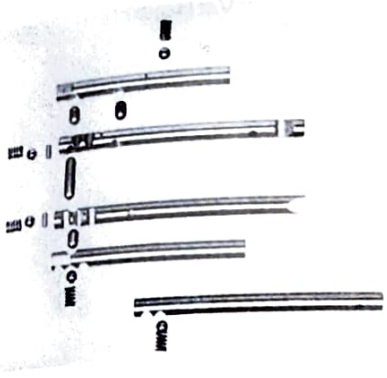


15. IF NECESSARY, REPLACE OIL SEAL

(a) Pry out the seal.

(b) Using a driver*, drive in the new seal.

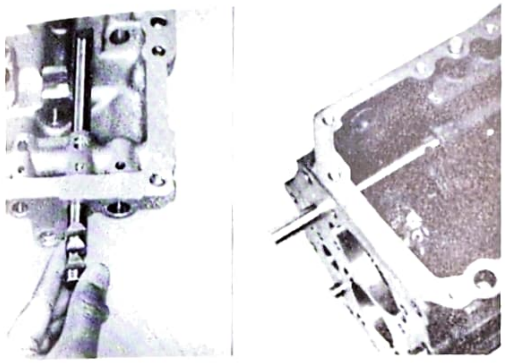
*SST 09304-12012 or Commercial driver



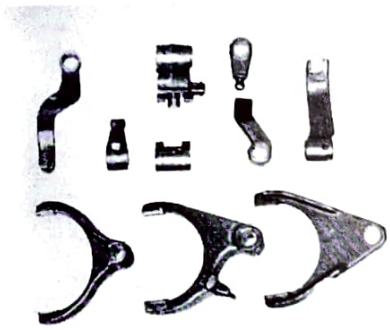
16. INSPECT SHIFT FORKSHAFTS

(a) Check sliding surface for wear or damage.

(b) Check springs, balls and interlock pins for wear or damage.



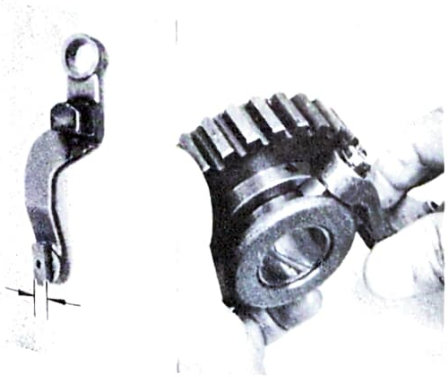
(c) Check that the shafts slide smoothly in each hole.



17. INSPECT SHIFT FORK, HEAD AND ARM

(a) Check the parts for wear or cracks.

(b) Check that the reverse restrict pin slides smoothly with spring and ball resistance.

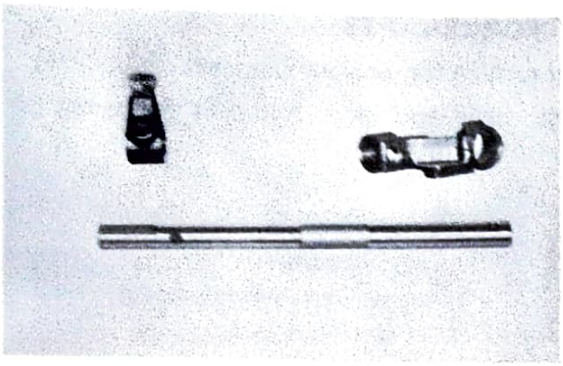


(c) Measure the reverse shift arm shoe thickness.

Minimum shoe thickness: 7.5 mm (0.295 in.)

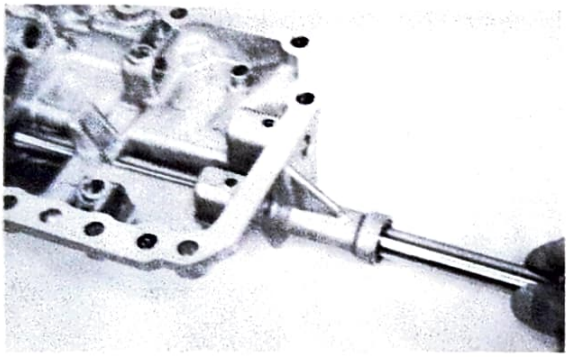
(d) Measure the clearance between the reverse idle gear and shoe.

Maximum shoe clearance: 0.6 mm (0.024 in.)

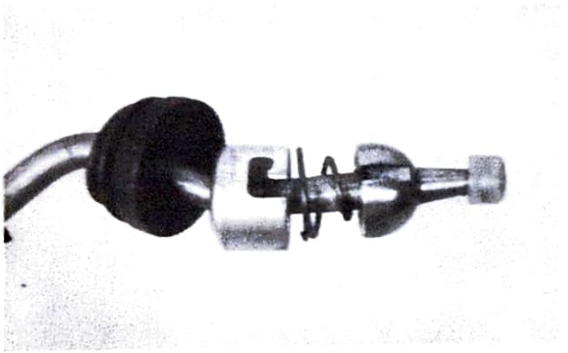


18. INSPECT SHIFT & SELECT LEVER, SHAFT AND SHIFT LEVER HOUSING

(a) Check the lever, shaft and housing for wear or damage.

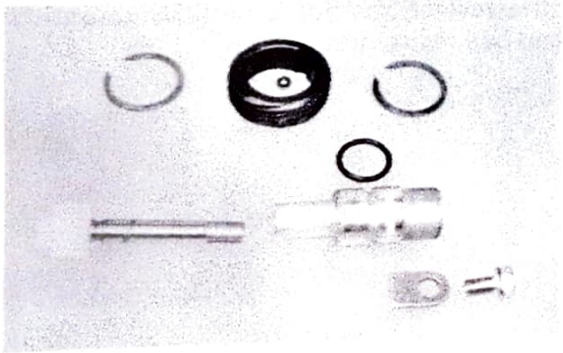


(b) Check that the shaft slides smoothly in the hole.



19. INSPECT SHIFT LEVER

Check the shift lever for wear or damage.

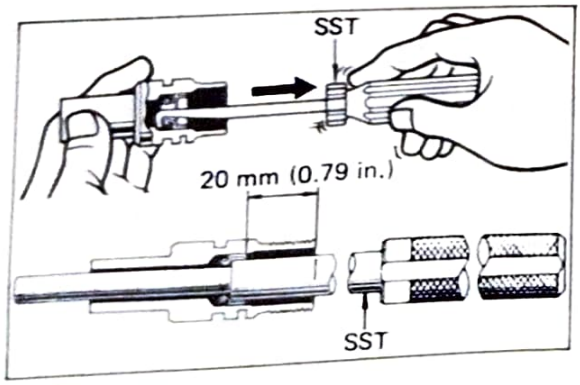


20. INSPECT SPEEDOMETER DRIVE GEAR AND DRIVEN GEAR

(a) Check gear teeth for wear or damage.

(b) Check gear shaft, oil seal and O-ring for wear or damage.

If the oil seal is worn or damaged, replace it.



21. IF NECESSARY REPLACE OIL SEAL

(a) Using a hook*, remove the seal.

*SST 09921-00010 or Commercial tool

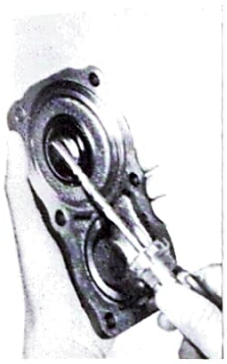
(b) Using a driver*, install the new seal.

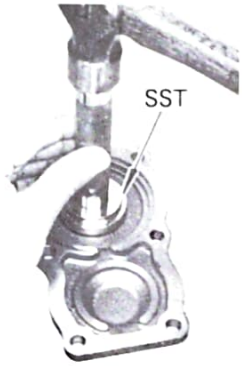
*SST 09201-60011 or Commercial driver

22. INSPECT FRONT BEARING RETAINER

Check the retainer and oil seal for wear or damage.

If the oil seal is worn or damaged, replace it.



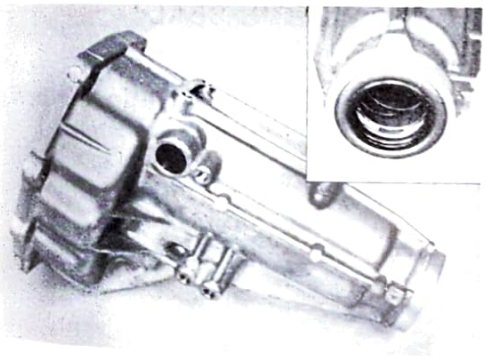


23. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver, pry out the seal.

(b) Using a driver*, drive in the new seal.

*SST 09608-30021 or Commercial driver

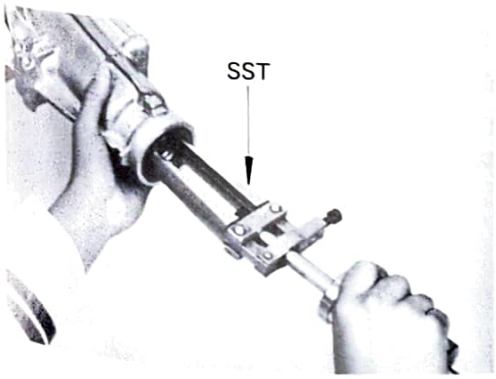


24. INSPECT EXTENSION HOUSING (RN 4x2)

(a) Check the extension housing for damage or cracks.

(b) Check the housing oil seal and bushing for wear or damage.

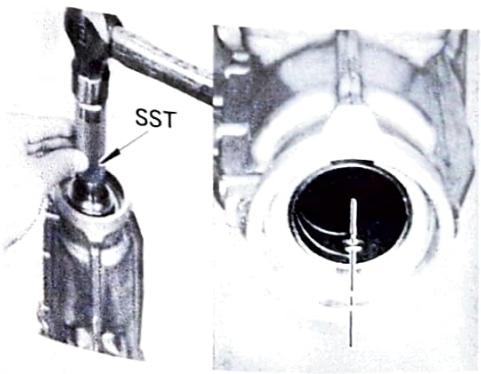
If worn or damaged, replace the oil seal and bushings.



25. IF NECESSARY, REPLACE OIL SEAL AND BUSHING (RN 4x2)

(a) Using a puller*, remove the oil seal.

*SST 09308-00010 or Commercial puller or SST 09308-10010 with extension housing installed



(b) Heat the extension housing end to 80 – 100°C (176 – 212°F) in an oil bath.

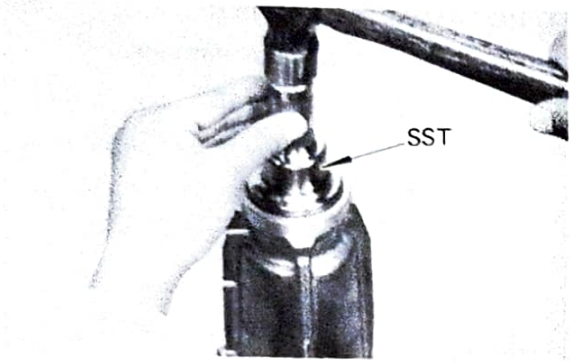
(c) Using a driver*, remove the bushing.

*SST 09307-30010 or Commercial driver

(d) Using a driver*, install the new bushing.

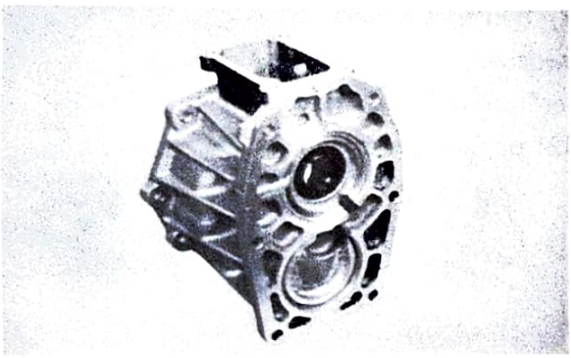
*SST 09307-30010 or Commercial driver

NOTE: Align the bushing oil hole and extension housing oil groove.



(e) Using a transmission oil plug*, drive in the new oil seal.

*SST 09325-20010 or Commercial driver

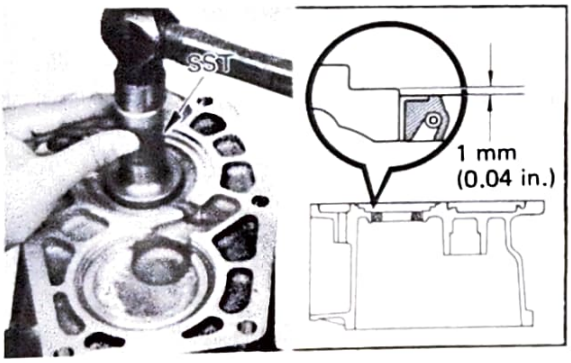


26. INSPECT TRANSFER ADAPTER (RN 4x4)

(a) Check the adapter for damage or cracks.

(b) Check the oil seal for wear or damage.

If the oil seal is worn or damaged, replace it.

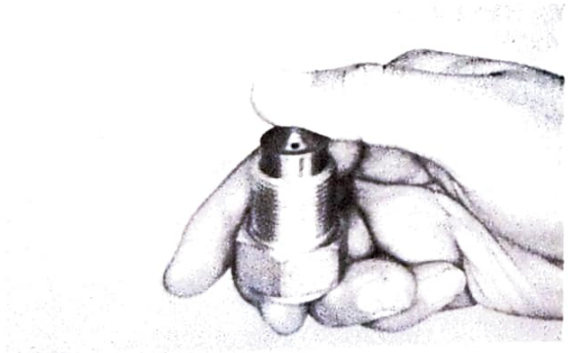


27. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver, pry out the seal.

(b) Using a transmission oil plug*, drive in the new oil seal.

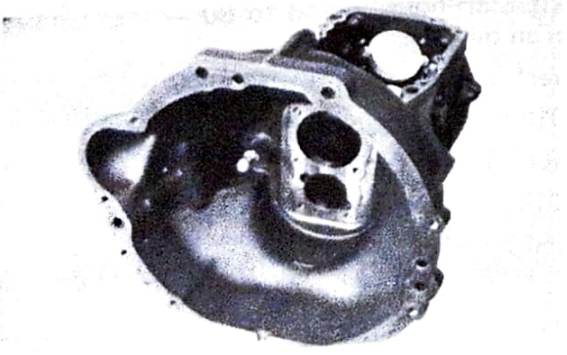
*SST 09325-12010 or Commercial driver



28. INSPECT SHIFT LEVER RETAINER

(a) Check the shift lever retainer for damage or cracks.

(b) Check that the restrict pin moves smoothly with spring resistance.

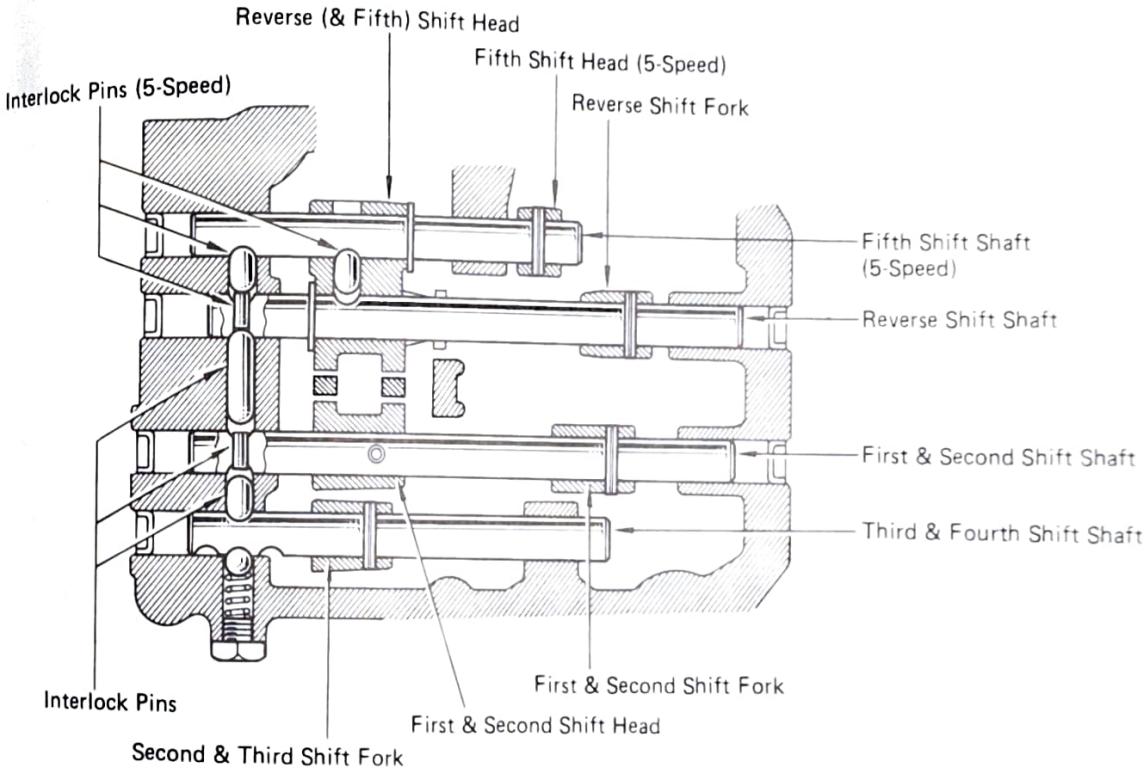


29. INSPECT TRANSMISSION CASE

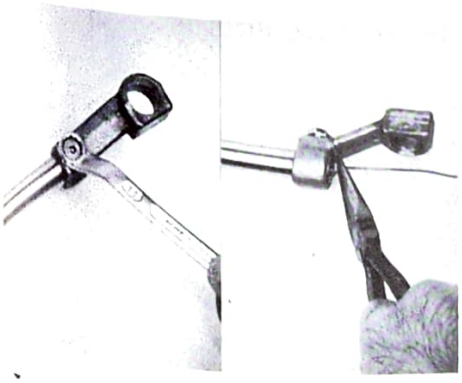
Check the case for damage or cracks.

ASSEMBLY OF TRANSMISSION
(See illustration on page 9-14)

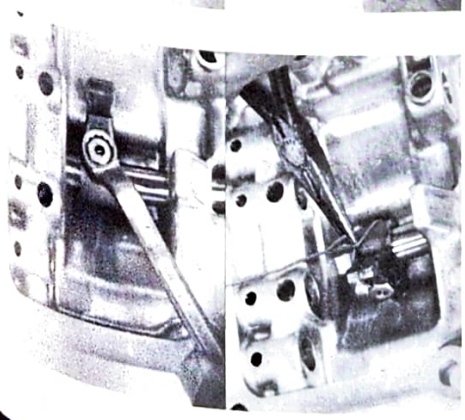
NOTE: Assemble the case cover as shown in the figure.



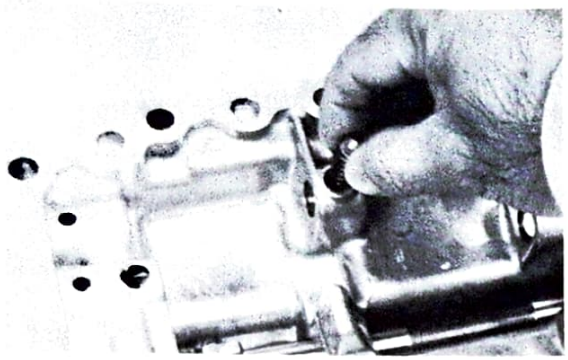
1. APPLY GEAR OIL TO BEARINGS, GEARS AND SHAFTS



2. INSTALL SHIFT LEVER HOUSING TO SHIFT & SELECT LEVER SHAFT (RN 4x2)
   (a) Align the holes of the shaft and housing.
   (b) Tighten the bolt.
   Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)
   (c) Secure the bolt with the lock wire.

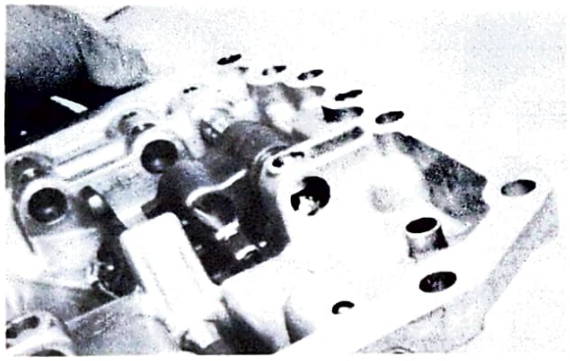


3. INSTALL SHIFT & SELECT LEVER AND SHAFT
   (a) Apply multipurpose grease to the oil seal lip.
   (b) Align the holes of the shaft and lever.
   (c) Tighten the bolt.
   Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)
   (d) Secure the bolt with the lock wire.

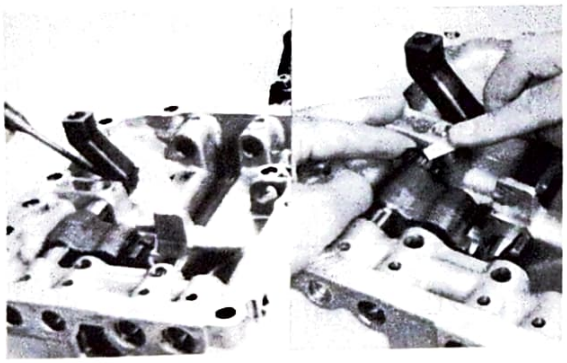


4. **INSTALL FIFTH & REVERSE SHIFT HEAD, FIFTH SHIFT ARM AND SHAFT (5-Speed)**

(a) Install the spring and shift detent ball in the hole.

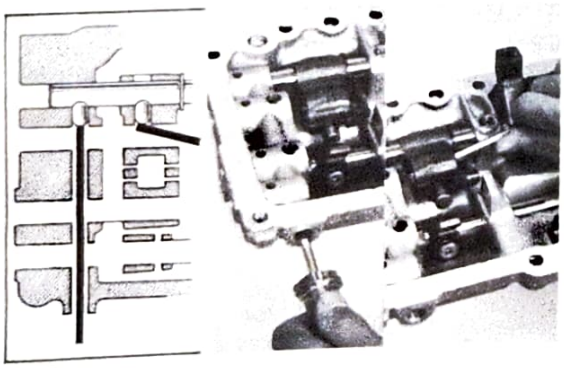


(b) Insert the shaft through the fifth & reverse shift head.



(c) Align the shaft and fifth shift arm pin holes, and drive in the slotted spring pin with a pin punch.

(d) Using a screwdriver, push in the E-ring to the fifth & reverse shift head.

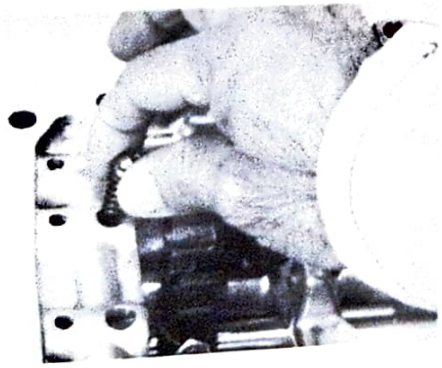


5. **INSTALL TWO INTERLOCK PINS (5-Speed)**

(a) Set the fifth shift fork shaft to the neutral position.

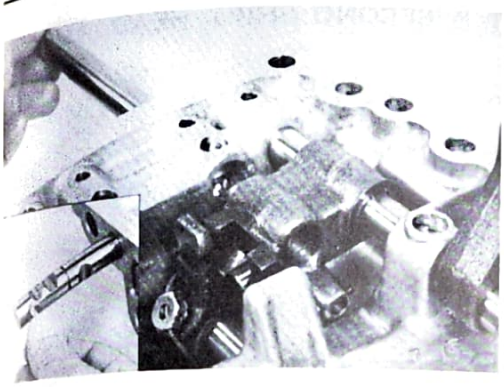
(b) Coat the two interlock pins with multipurpose grease.

(c) Push in the two interlock pins to the shaft grooves with a screwdriver.



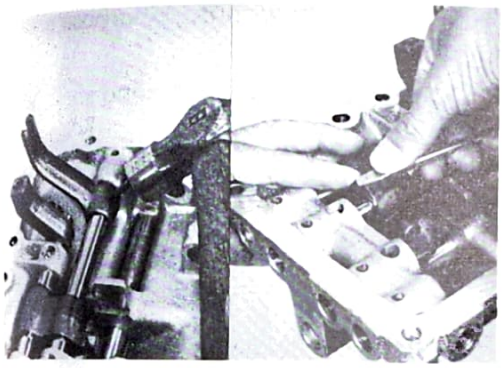
6. **INSTALL REVERSE SHIFT FORK AND SHAFT (5-Speed)**

(a) Install the spring and shift detent ball in the hole.



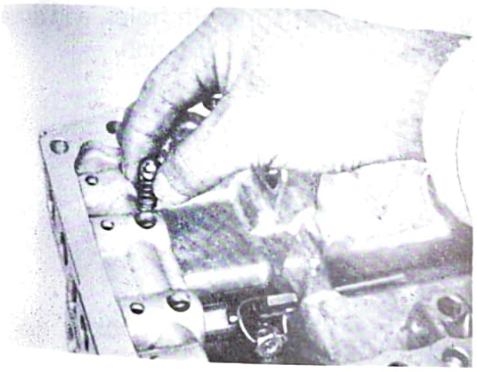
(b) Coat the small interlock pin with multipurpose grease and install it in the shaft.

(c) Insert the shaft through the fifth & reverse shift head and reverse shift fork.



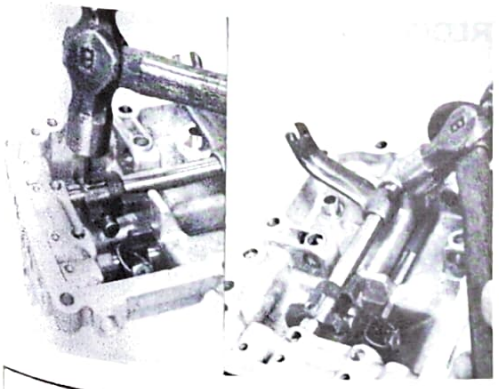
(d) Align the shaft and shift fork pin holes, and drive in the slotted spring pin.

(e) Using a screwdriver, push in the E-ring to the reverse shift fork shaft.



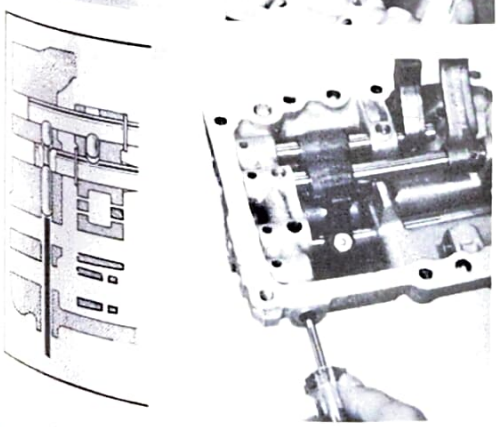
7. INSTALL REVERSE SHIFT HEAD, FORK AND SHAFT (4-Speed)

(a) Install the spring and shift detent ball in the hole.



(b) Insert the shaft through the reverse shift head and arm.

(c) Align the shaft, head and fork pin holes, and drive in the slotted spring pins with a pin punch.

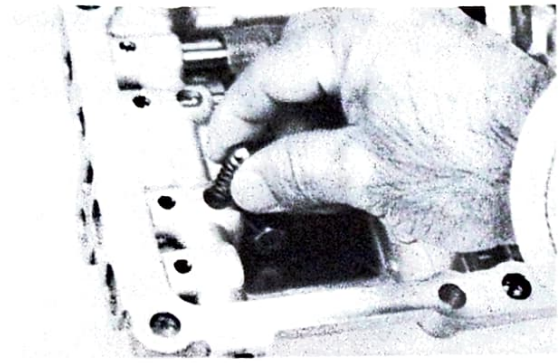


8. INSTALL INTERLOCK PIN

(a) Set the shift fork shafts to the neutral position.

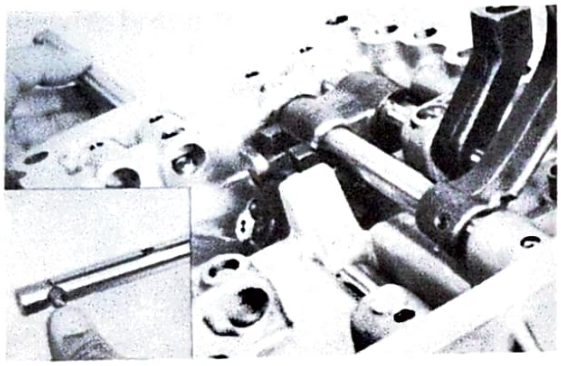
(b) Coat the interlock pin with multipurpose grease.

(c) Push in the interlock pin to the shaft groove with a screwdriver.



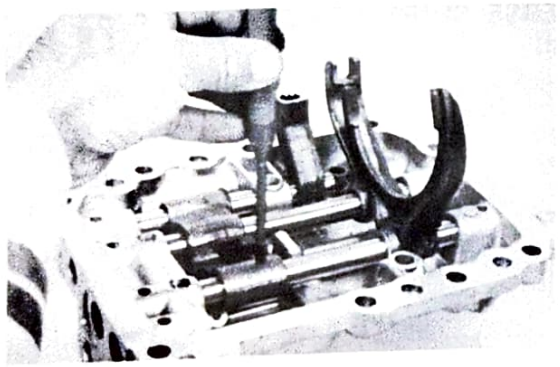
9. INSTALL FIRST & SECOND SHIFT HEAD, FORK AND SHAFT

(a) Install the spring and shift detent ball in the hole.

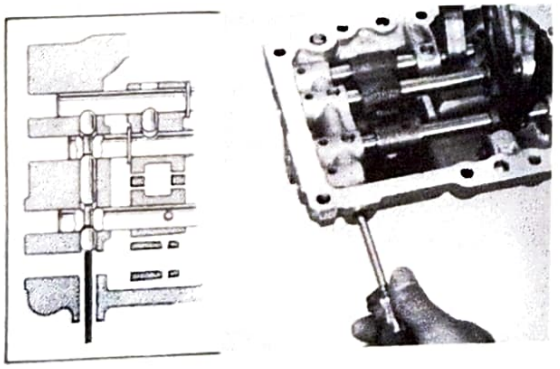


(b) Coat the small interlock pin with multipurpose grease and install it in the shaft.

(c) Insert the shaft through the first & second shift head and fork.



(d) Align the shaft, head and fork pin holes, and drive in the slotted spring pins with a pin punch.

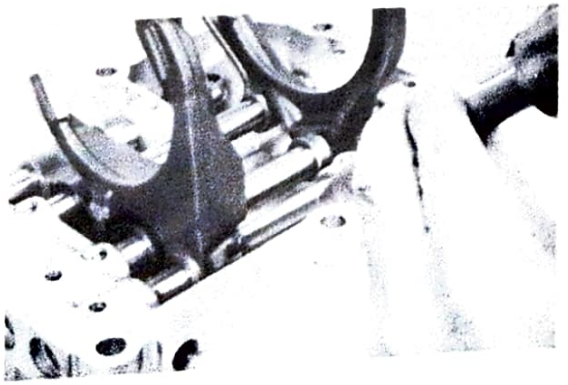


10. INSTALL INTERLOCK PIN

(a) Set the shift fork shafts to the neutral position.

(b) Coat the interlock pin with multipurpose grease.

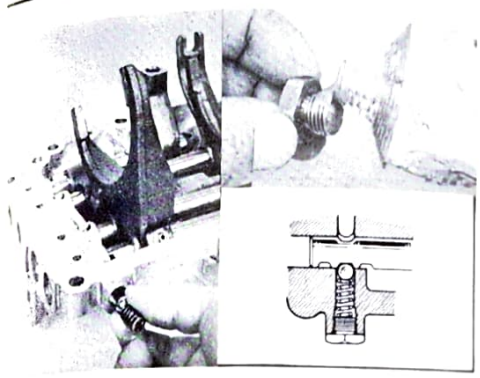
(c) Push in the interlock pin to the shaft groove with a screwdriver.



11. INSTALL SECOND & THIRD SHIFT FORK AND SHAFT

(a) Insert the fork shaft through the shift fork.

(b) Align the shaft and fork pin holes, and drive in the slotted spring pin with a pin punch.

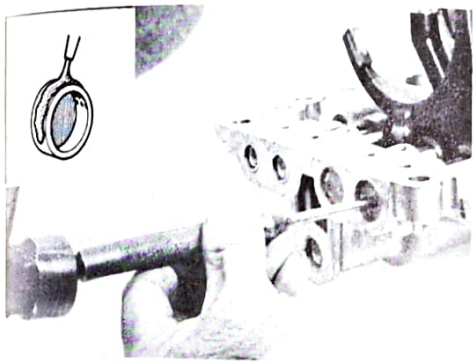


12. INSTALL SHIFT DETENT BALL, SPRING AND HOLDER

(a) Install the shift detent ball and spring to the hole.

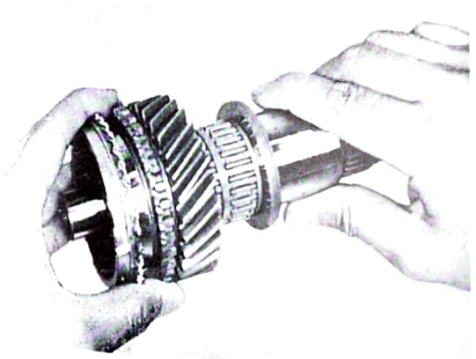
(b) Apply liquid sealer to the holder and tighten it.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



13. INSTALL BLIND PLUGS

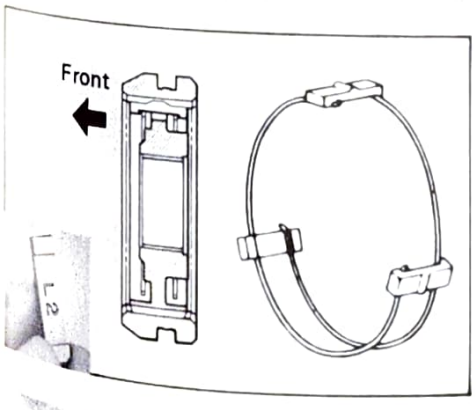
Apply liquid sealer to the blind plugs and drive them into the case cover.



14. INSTALL THIRD GEAR

(a) Apply multipurpose grease to the output shaft.

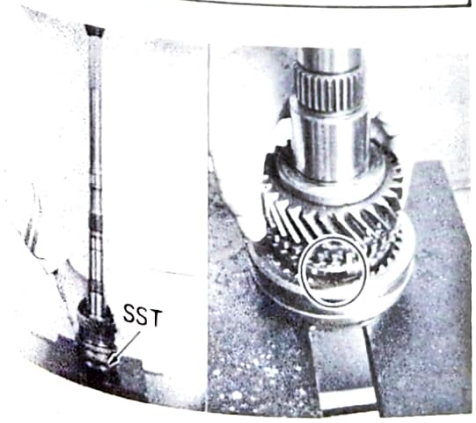
(b) Install the needle roller bearings, third gear and synchronizer ring on the output shaft.



15. INSERT CLUTCH HUB NO. 2 INTO HUB SLEEVE

(a) Install the clutch hub No. 2 and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys so that the spring ends are not in line, as shown in the figure.



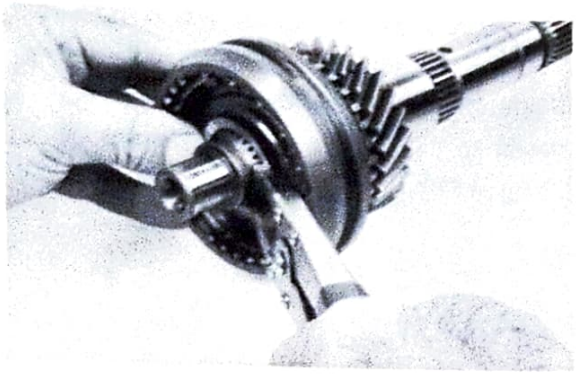
16. INSTALL CLUTCH HUB NO. 2

(a) Apply multipurpose grease to the output shaft.

(b) Align the synchronizer ring slots with the shifting keys.

(c) Using a press and collar*, install the clutch hub No. 2.

*SST 09506-30011 or Commercial collar

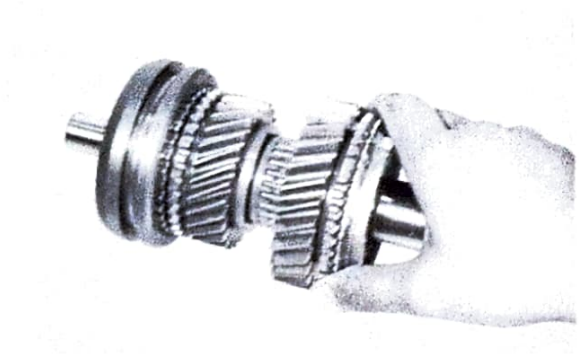


17. INSTALL SNAP RING

Select a snap ring which will allow 0 – 0.10 mm (0 – 0.0039 in.) axial play and install it on the shaft.

Snap ring thickness

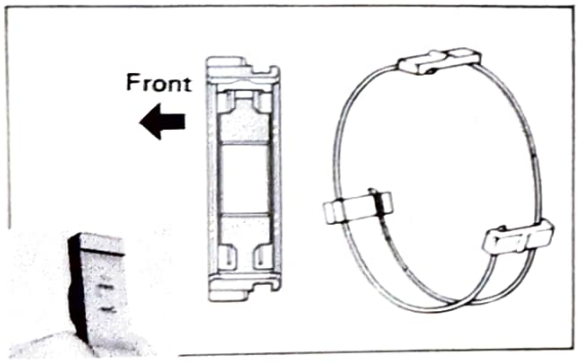
Mark	Part No.	Thickness mm (in.)
D	90520-28245	1.80 – 1.85 (0.0709 – 0.0728)
D-1	90520-28010	1.85 – 1.90 (0.0728 – 0.0748)
E	90520-28246	1.90 – 1.95 (0.0748 – 0.0768)
E-1	90520-28011	1.95 – 2.00 (0.0768 – 0.0787)
F	90520-28248	2.00 – 2.05 (0.0787 – 0.0807)



18. INSTALL SECOND GEAR

(a) Apply multipurpose grease to the output shaft.

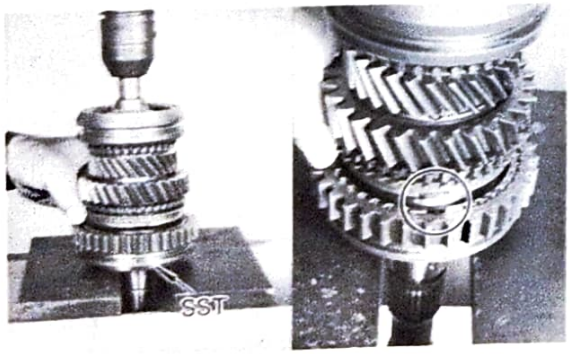
(b) Install the needle roller bearing, second gear and synchronizer ring on the output shaft.



19. INSERT CLUTCH HUB NO. 1 INTO REVERSE GEAR

(a) Install the clutch hub No. 1 and shifting keys to the reverse gear.

(b) Install the shifting key springs under the shifting keys so that the spring ends are not in line, as shown in the figure.



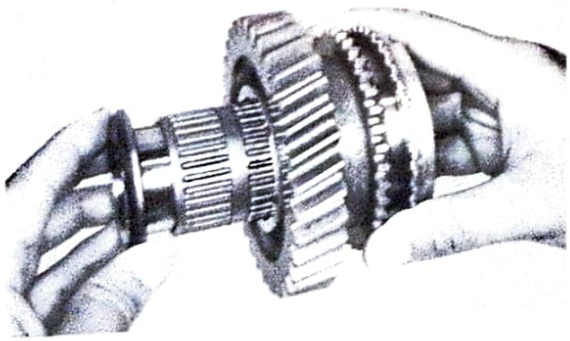
20. INSTALL CLUTCH HUB NO. 1 (REVERSE GEAR) ON OUTPUT SHAFT

(a) Apply multipurpose grease to the output shaft.

(b) Align the synchronizer ring slots with the shifting keys.

(c) Using a press and collar*, install the clutch hub No. 1.

*SST 09506-30011 or Commercial collar

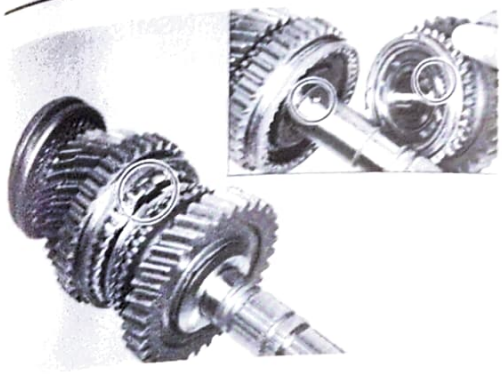


21. ASSEMBLE FIRST GEAR, NEEDLE BEARINGS, INNER RACE AND SYNCHRONIZER RING

(a) Apply multipurpose grease to the needle roller bearings.

(b) Insert the needle roller bearings and first gear on the inner race.

(c) Place the synchronizer ring on the first gear.

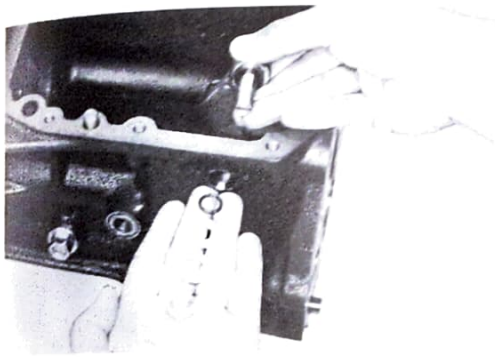


22. INSTALL FIRST GEAR ASSEMBLY ON OUTPUT SHAFT

(a) Install the inner race locking ball to the output shaft.

(b) Align the inner race slot with the locking ball.

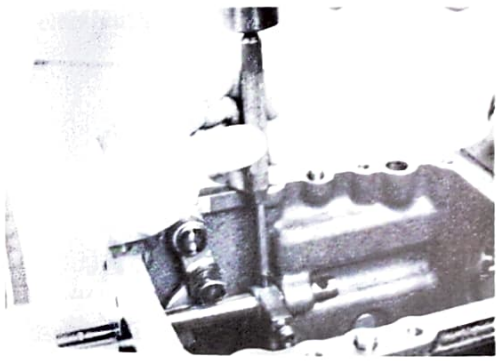
(c) Install the first gear assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys.



23. INSTALL REVERSE SHIFT ARM

(a) Install the reverse shift arm and pivot to the transmission case.

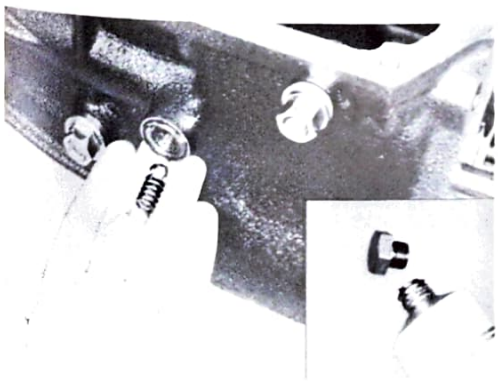
(b) Install the O-ring, plate washer, spring washer and nut to the pivot.



24. INSTALL FIFTH SHIFT HEAD AND SHAFT (5-Speed)

(a) Insert the shift fork shaft through the shift head.

(b) Align the shaft and head pin holes, and drive in the slotted spring pin with a pin punch.

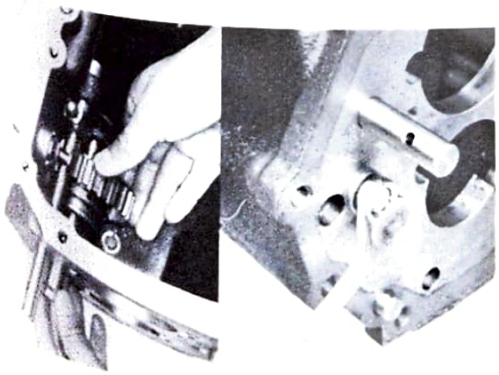


25. INSTALL SHIFT DETENT BALL, SPRING AND HOLDER (5-Speed)

(a) Install the shift detent ball and spring to the hole.

(b) Apply liquid sealer to the holder and tighten it.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



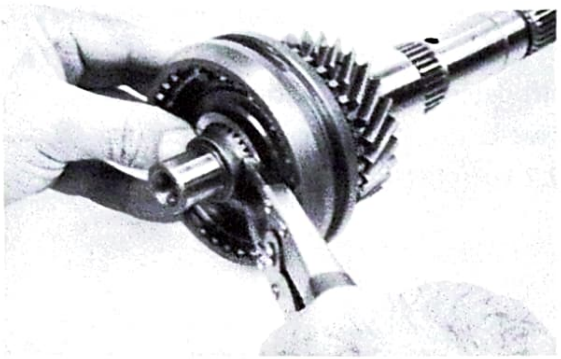
26. INSTALL REVERSE IDLER GEAR AND SHAFT

(a) Align the reverse idler gear groove with the reverse shift arm shoe.

(b) Install the reverse idler gear shaft through the gear.

(c) Secure the shaft with the lock plate. Tighten the bolt.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

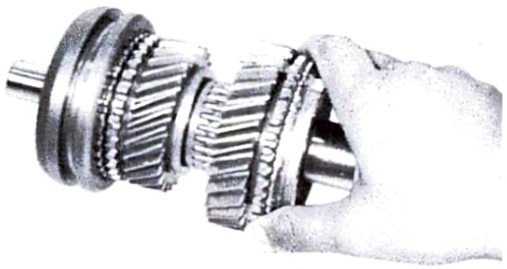


17. INSTALL SNAP RING

Select a snap ring which will allow 0 – 0.10 mm (0 – 0.0039 in.) axial play and install it on the shaft.

Snap ring thickness

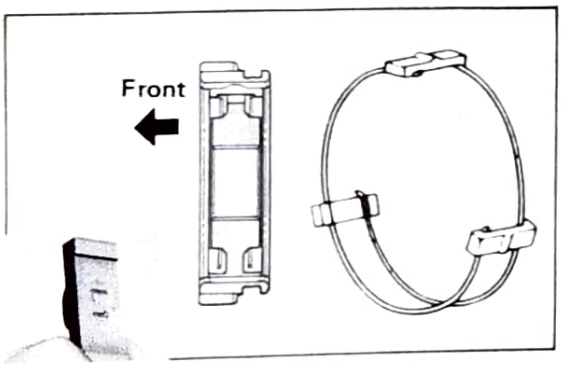
Mark	Part No.	Thickness mm (in.)
D	90520-28245	1.80 – 1.85 (0.0709 – 0.0728)
D-1	90520-28010	1.85 – 1.90 (0.0728 – 0.0748)
E	90520-28246	1.90 – 1.95 (0.0748 – 0.0768)
E-1	90520-28011	1.95 – 2.00 (0.0768 – 0.0787)
F	90520-28248	2.00 – 2.05 (0.0787 – 0.0807)



18. INSTALL SECOND GEAR

(a) Apply multipurpose grease to the output shaft.

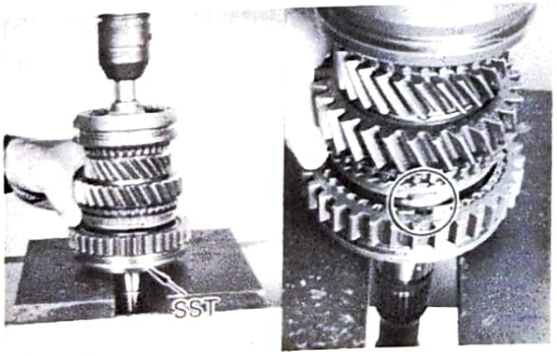
(b) Install the needle roller bearing, second gear and synchronizer ring on the output shaft.



19. INSERT CLUTCH HUB NO. 1 INTO REVERSE GEAR

(a) Install the clutch hub No. 1 and shifting keys to the reverse gear.

(b) Install the shifting key springs under the shifting keys so that the spring ends are not in line, as shown in the figure.



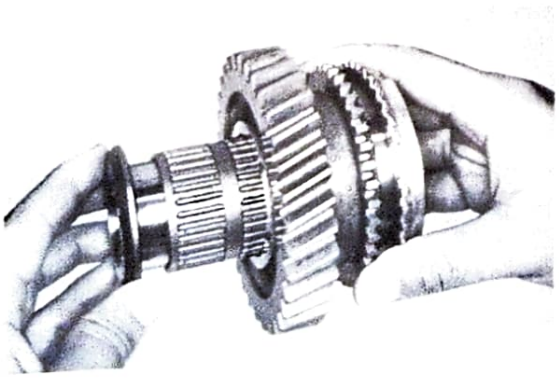
20. INSTALL CLUTCH HUB NO. 1 (REVERSE GEAR) ON OUTPUT SHAFT

(a) Apply multipurpose grease to the output shaft.

(b) Align the synchronizer ring slots with the shifting keys.

(c) Using a press and collar*, install the clutch hub No. 1.

*SST 09506-30011 or Commercial collar

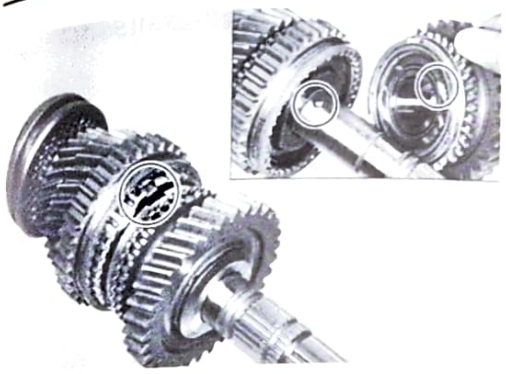


21. ASSEMBLE FIRST GEAR, NEEDLE BEARINGS, INNER RACE AND SYNCHRONIZER RING

(a) Apply multipurpose grease to the needle roller bearings.

(b) Insert the needle roller bearings and first gear on the inner race.

(c) Place the synchronizer ring on the first gear.

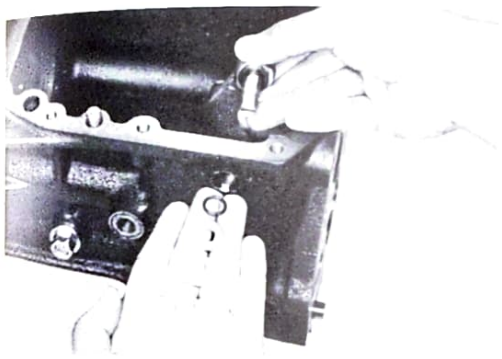


22. INSTALL FIRST GEAR ASSEMBLY ON OUTPUT SHAFT

(a) Install the inner race locking ball to the output shaft.

(b) Align the inner race slot with the locking ball.

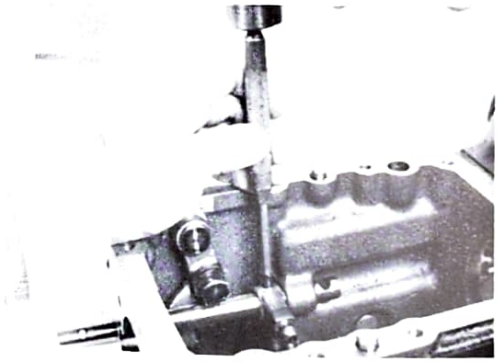
(c) Install the first gear assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys.



23. INSTALL REVERSE SHIFT ARM

(a) Install the reverse shift arm and pivot to the transmission case.

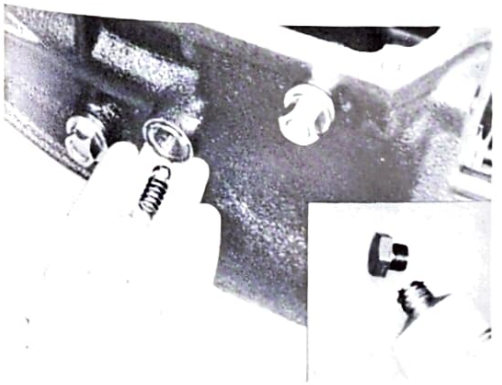
(b) Install the O-ring, plate washer, spring washer and nut to the pivot.



24. INSTALL FIFTH SHIFT HEAD AND SHAFT (5-Speed)

(a) Insert the shift fork shaft through the shift head.

(b) Align the shaft and head pin holes, and drive in the slotted spring pin with a pin punch.

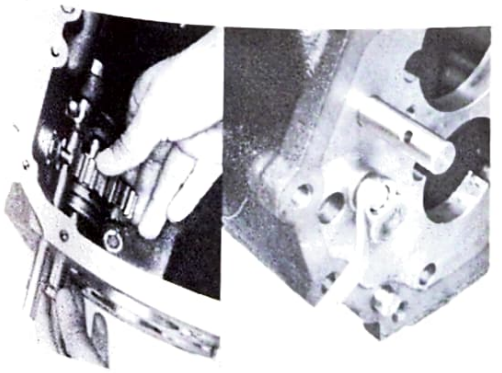


25. INSTALL SHIFT DETENT BALL, SPRING AND HOLDER (5-Speed)

(a) Install the shift detent ball and spring to the hole.

(b) Apply liquid sealer to the holder and tighten it.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



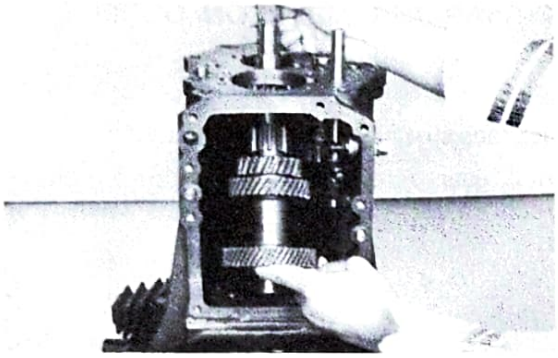
26. INSTALL REVERSE IDLER GEAR AND SHAFT

(a) Align the reverse idler gear groove with the reverse shift arm shoe.

(b) Install the reverse idler gear shaft through the gear.

(c) Secure the shaft with the lock plate. Tighten the bolt.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

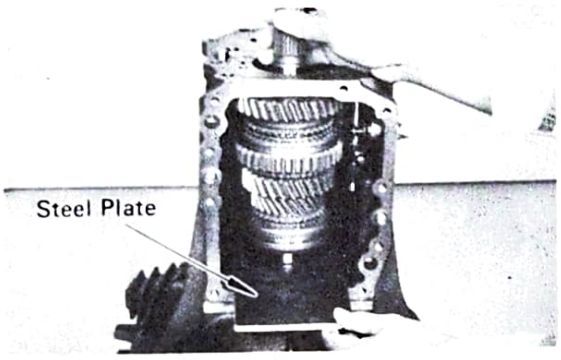


27. INSTALL COUNTERSHAFT TO TRANSMISSION CASE

(a) Stand the transmission case on its front end.

(b) Put the countershaft into the case.

CAUTION: Be careful not to damage either end.

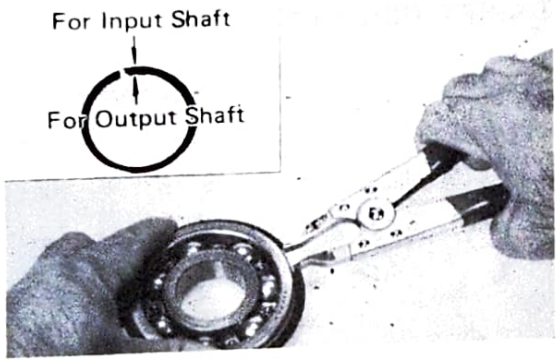


28. INSTALL OUTPUT SHAFT TO TRANSMISSION CASE

(a) Put the output shaft into the case.

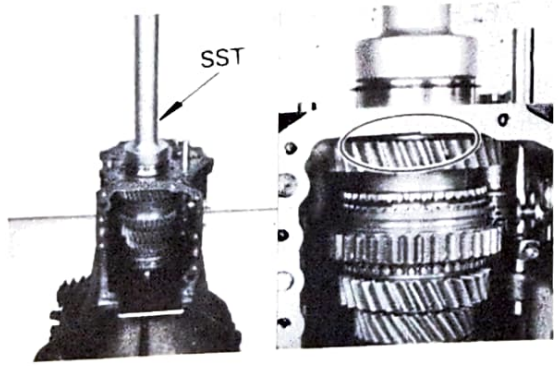
CAUTION: Be careful not to damage the front end of the shaft.
Be careful that the first gear and needle roller bearing do not drop off.

(b) Place a steel plate of about 10 mm (0.39 in.) thickness between the output shaft and case.



(c) Using snap ring pliers, install the snap ring onto the output shaft rear bearing.

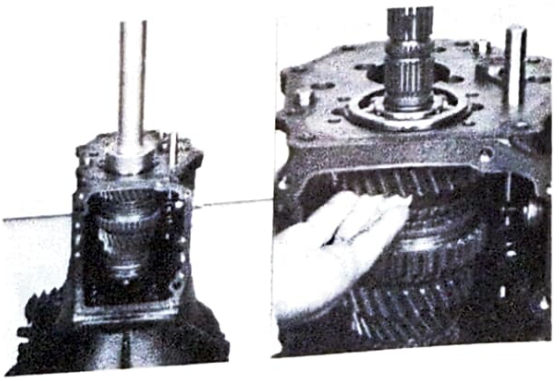
NOTE: Make sure to differentiate the output shaft bearing snap ring from the one for the input shaft bearing.



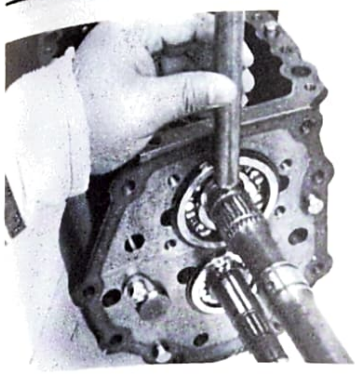
(d) Using a bearing driver*, drive in the bearing until it comes into contact with the first gear needle roller bearing inner race.

*SST 09309-35010 or Commercial driver

CAUTION: Be careful that the first gear bearing inner race lock ball does not come out.



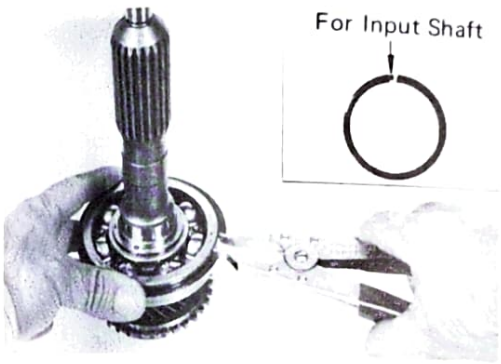
(e) Remove the steel plate and drive in the bearing until its snap ring is flush with the case end.



(f) Select a snap ring which will allow 0 – 0.10 mm (0 – 0.0039 in.) axial play and install it on the shaft. (4-Speed)

Snap ring thickness

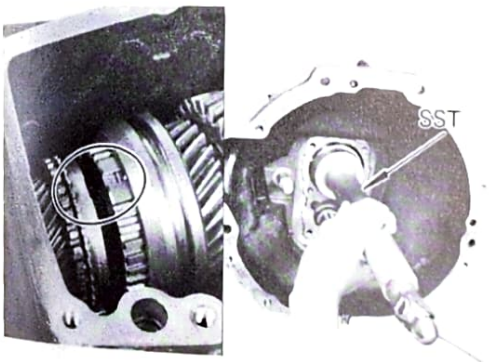
Mark	Part No.	Thickness mm (in.)
A	90520-25005	2.67 – 2.72 (0.1051 – 0.1071)
B	90520-25006	2.73 – 2.78 (0.1075 – 0.1094)
C	90520-25009	2.79 – 2.84 (0.1098 – 0.1118)
D	90520-25010	2.85 – 2.90 (0.1122 – 0.1141)
E	90520-25011	2.91 – 2.96 (0.1146 – 0.1165)
F	90520-25012	2.97 – 3.02 (0.1169 – 0.1189)
G	90520-25013	3.03 – 3.08 (0.1193 – 0.1213)
H	90520-25014	3.09 – 3.14 (0.1217 – 0.1236)
J	90520-25015	3.15 – 3.20 (0.1240 – 0.1260)
K	90520-25016	3.21 – 3.26 (0.1264 – 0.1283)
L	90520-25017	3.27 – 3.32 (0.1287 – 0.1307)



29. INSTALL INPUT SHAFT

(a) Using snap ring pliers, install the snap ring onto the input shaft bearing.

(b) Coat the needle roller bearing with multipurpose grease.



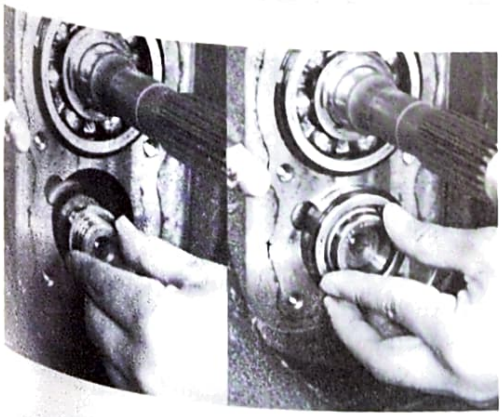
(c) Align the synchronizer ring slots with the shifting keys.

(d) Using a bearing driver*, drive in the input shaft.

*SST 09309-35010 or Commercial driver

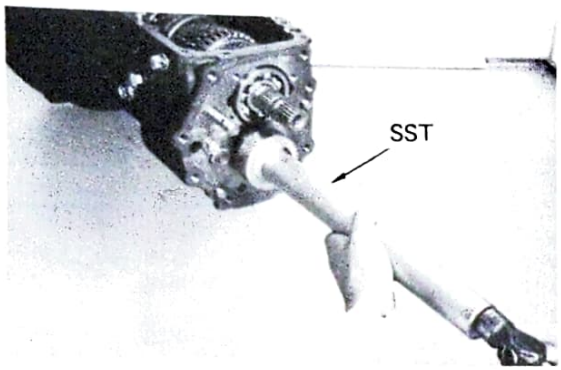
30. INSTALL COUNTERSHAFT FRONT AND CENTER BEARINGS

(a) Using snap ring pliers, install the snap rings onto the front and center bearings.

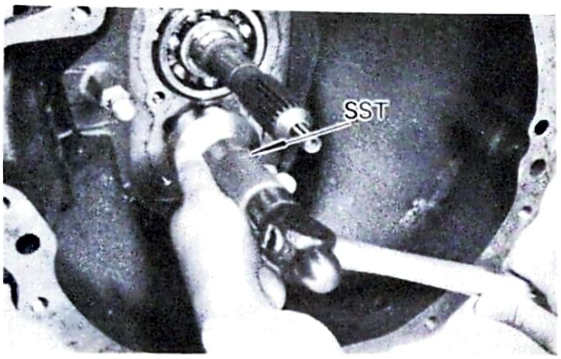


(b) Assemble the front bearing inner race piece with its tapered side toward the gear.

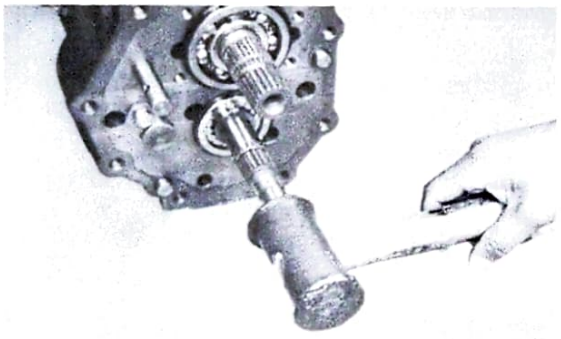
(c) Temporarily install the front bearing to the case.



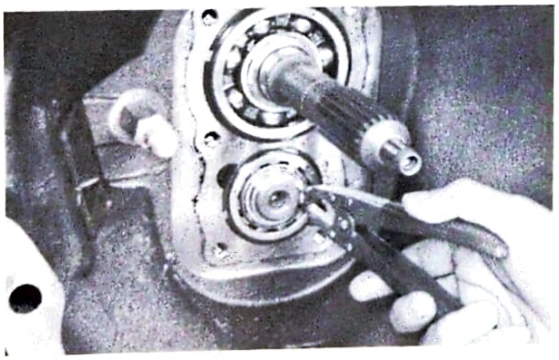
(d) Using a bearing driver*, drive in the center bearing.
*SST 09309-35010 or Commercial driver



(e) Using a bearing driver*, drive in the front bearing.
*SST 09310-35010 or Commercial driver



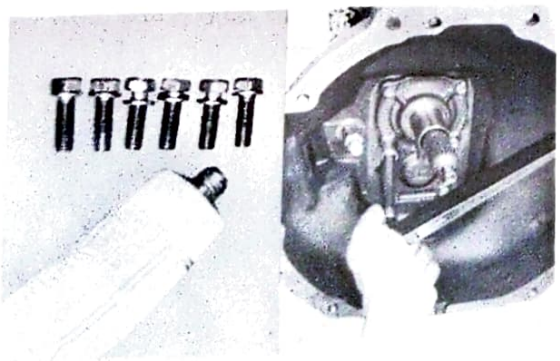
NOTE: When installing the front bearing, support the coutershaft rear end with a 3 – 5 lb hammer or equivalant.



(f) Select a snap ring which will allow 0 – 0.10 mm (0 – 0.0039 in.) axial play and install it on the shaft.

Snap ring thickness

Mark	Part No.	Thickness mm (in.)
1	90520-23115	2.05 – 2.10 (0.0807 – 0.0827)
2	90520-23089	2.10 – 2.15 (0.0827 – 0.0846)
3	90520-23143	2.15 – 2.20 (0.0846 – 0.0866)
4	90520-23090	2.20 – 2.25 (0.0866 – 0.0886)
5	90520-23144	2.25 – 2.30 (0.0886 – 0.0906)
6	90520-23145	2.30 – 2.35 (0.0906 – 0.0925)



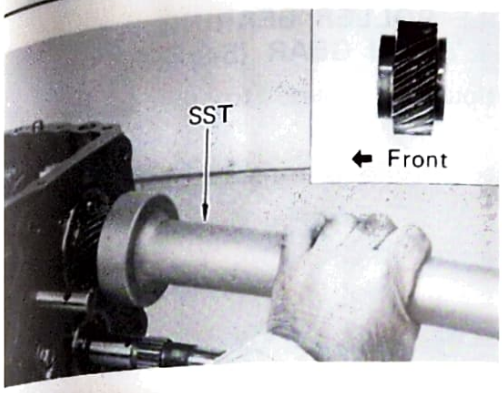
31. INSTALL BEARING RETAINER WITH NEW GASKET

(a) Place the new gasket in position.

(b) Apply multipurpose grease to the oil seal.

(c) Apply liquid sealer to the mounting bolts and tighten the retainer.

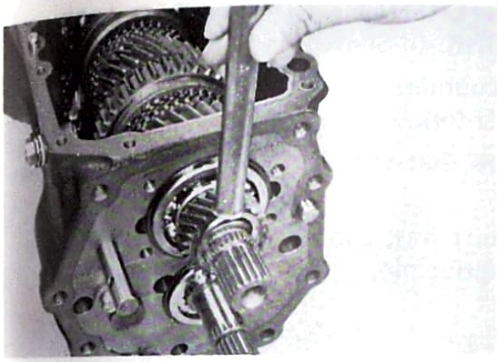
Torque: 2.0 – 2.8 kg-m (15 – 20 ft-lb)



32. INSTALL FIFTH GEAR TO OUTPUT SHAFT (5-Speed)

(a) Using a driver*, drive in the fifth gear to the output shaft with the long sleeve side faced toward the front.

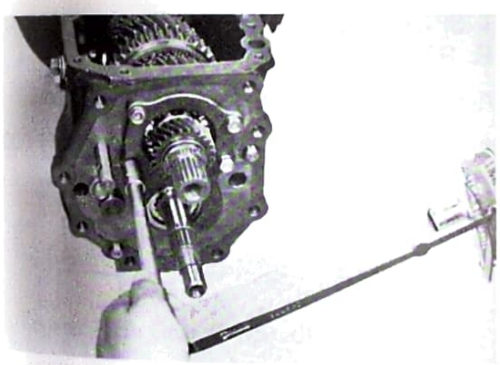
*SST 09309-35010 or Commercial driver.



(b) Select a snap ring which will allow 0 – 0.10 mm (0 – 0.0039 in.) axial play and install it on the shaft.

Snap ring thickness

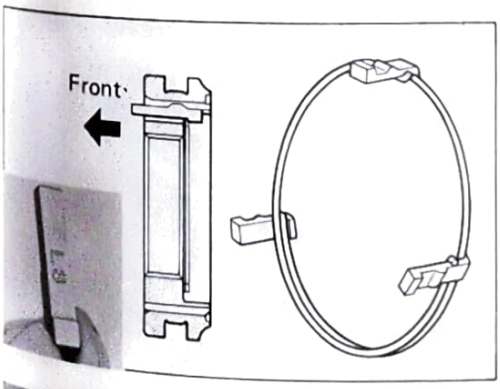
Mark	Part No.	Thickness mm (in.)
A	90520-25005	2.67 – 2.72 (0.1051 – 0.1071)
B	90520-25006	2.73 – 2.78 (0.1075 – 0.1094)
C	90520-25009	2.79 – 2.84 (0.1098 – 0.1118)
D	90520-25010	2.85 – 2.90 (0.1122 – 0.1141)
E	90520-25011	2.91 – 2.96 (0.1146 – 0.1165)
F	90520-25012	2.97 – 3.02 (0.1169 – 0.1189)
G	90520-25013	3.03 – 3.08 (0.1193 – 0.1213)
H	90520-25014	3.09 – 3.14 (0.1217 – 0.1236)
J	90520-25015	3.15 – 3.20 (0.1240 – 0.1260)
K	90520-25016	3.21 – 3.26 (0.1264 – 0.1283)
L	90520-25017	3.27 – 3.32 (0.1287 – 0.1307)



33. INSTALL REAR BEARING RETAINER

Install the rear bearing retainer and tighten the mounting bolts.

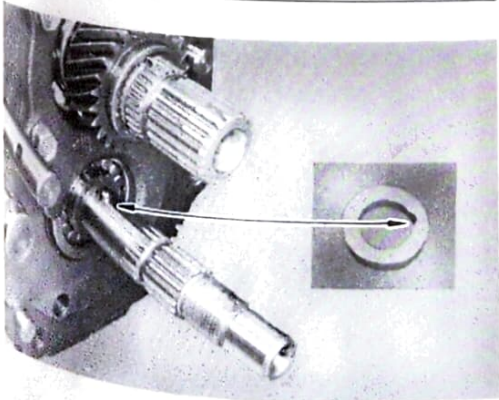
Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



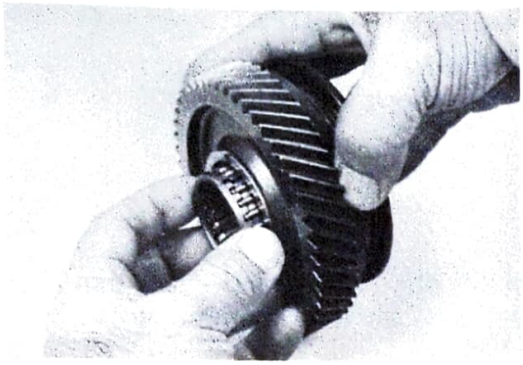
34. INSERT CLUTCH HUB NO.3 INTO HUB SLEEVE (COUNTERSHAFT FIFTH GEAR) (5-Speed)

(a) Install the clutch hub No.3 and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys so that the spring ends are not in line.



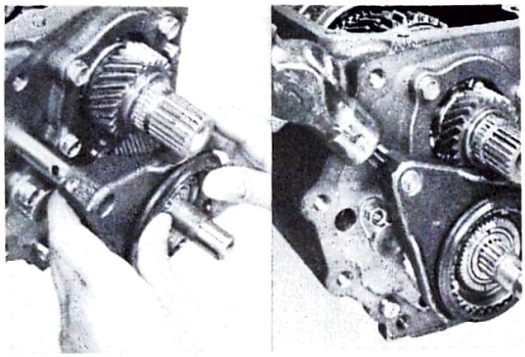
35. INSTALL LOCK BALL AND THRUST WASHER (5-Speed)



36. INSTALL NEEDLE ROLLER BEARING INTO COUNTERSHAFT FIFTH GEAR (5-Speed)

(a) Apply multipurpose grease to the needle roller bearing.

(b) Insert the needle roller bearing into the countershaft fifth gear.

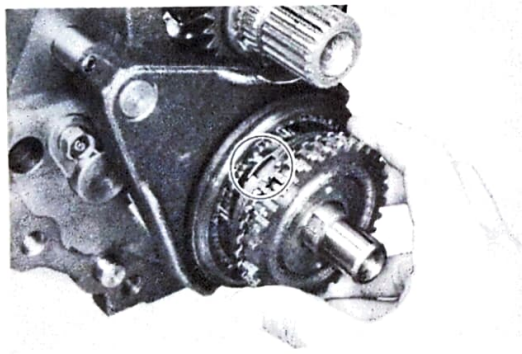


37. INSTALL COUNTERSHAFT FIFTH GEAR ASSEMBLY AND SHIFT FORK (5-Speed)

(a) Install the countershaft fifth gear assembly together with the shift fork.

CAUTION: Insure that the shift fork pin hole is toward the front.

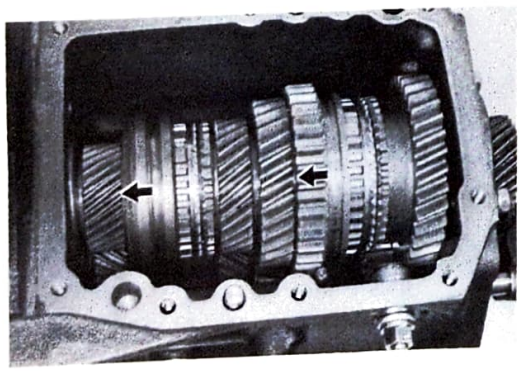
(b) Align the shift fork and shaft pin holes and drive in the slotted spring pin.



38. INSTALL GEAR SPLINE NO.5 AND SYNCHRONIZER RING (5-Speed)

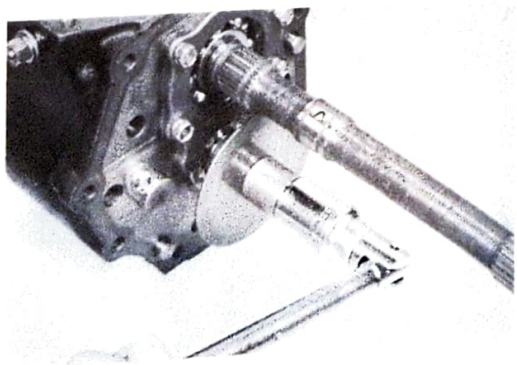
(a) Place the synchronizer ring on the gear spline No.5.

(b) Install the gear spline No.5 with the synchronizer ring slots aligned with the shifting keys.

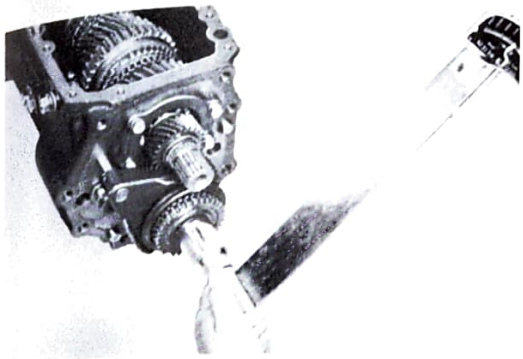


39. ENGAGE GEAR DOUBLE MESHING INTO SECOND AND THIRD

NOTE: Do not shift into first gear to avoid overshifting.



40. INSTALL OIL SEPARATOR (4-Speed)



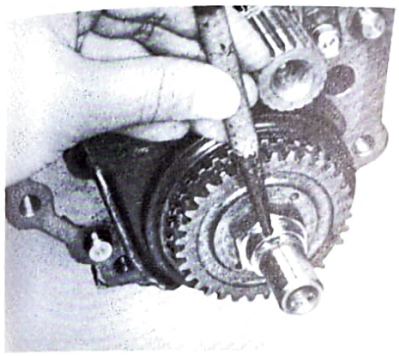
41. TIGHTEN LOCK NUT

(a) Using a socket wrench*, tighten the lock nut.

*SST 09326-22011 or Commercial socket

Torque: 11.0 – 14.0 kg-m (80 – 101 ft-lb)

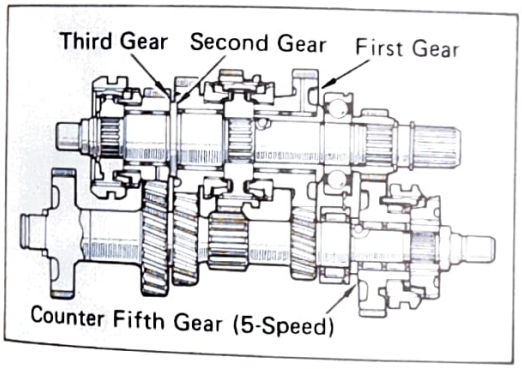
(b) Release the gear double meshing to the neutral position.



42. STAKE LOCK NUT

Using a punch, stake the lock nut.

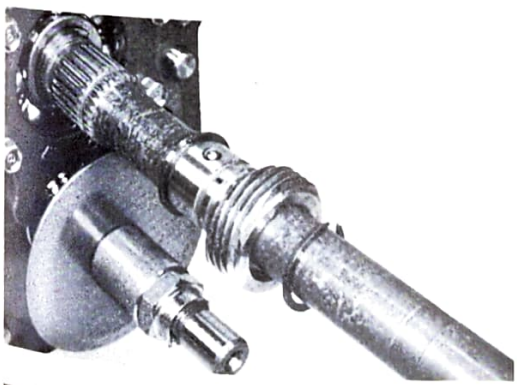
NOTE: Be careful not to damage the end of the counter-shaft.



43. MEASURE THRUST CLEARANCE FOR EACH GEAR

Using a feeler gauge, measure the thrust clearance for each gear.

Standard clearance:	**0.10 – 0.25 mm (0.0039 – 0.0098 in.)**
Maximum clearance:	**0.25 mm (0.0098 in.)**

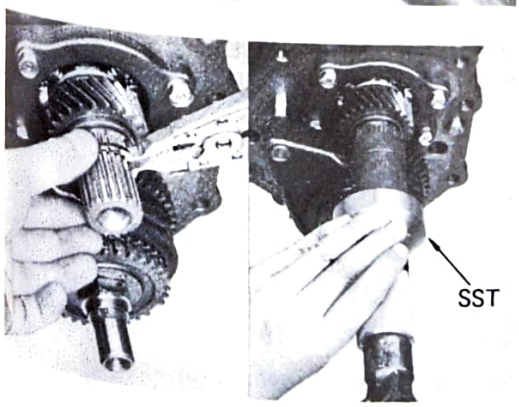


44. INSTALL SPEEDOMETER DRIVE GEAR (RN 4x2)

(a) Using snap ring pliers, install the snap ring.

(b) Install the lock ball and speedometer drive gear on the output shaft.

(c) Install the other snap ring.

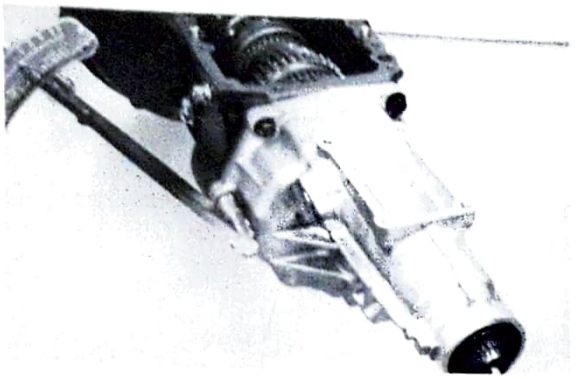


45. INSTALL SLEEVE ONTO OUTPUT SHAFT (RN 4x4)

(a) Using snap ring pliers, install the snap ring.

(b) Using a driver*, drive in the sleeve onto the output shaft.

*SST 09310-35010 or Commercial driver



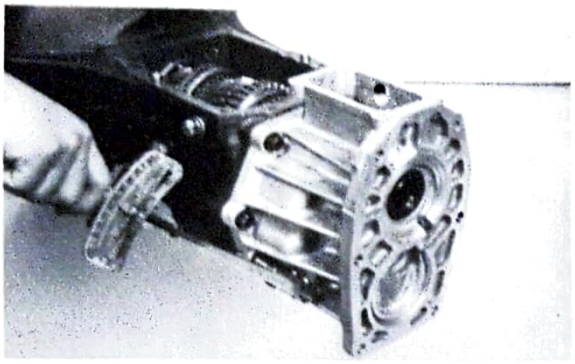
46. INSTALL EXTENSION HOUSING WITH NEW GASKET (RN 4x2)

(a) Place the new gasket in position.

(b) Apply multipurpose grease to the oil seal and needle roller bearing.

(c) Tighten the extension housing mounting bolts.

Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)



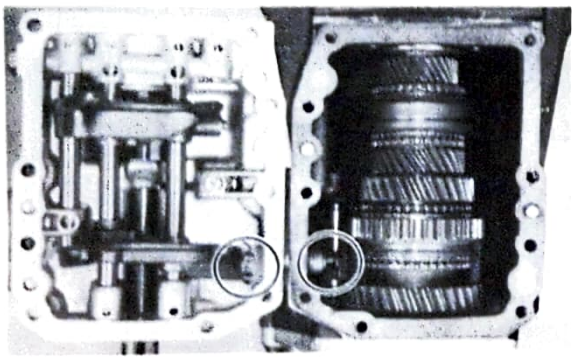
47. INSTALL TRANSFER ADAPTER WITH NEW GASKET (RN 4x4)

(a) Place the new gasket in position.

(b) Apply multipurpose grease to the oil seal and needle roller bearing.

(c) Tighten the transfer adapter mounting bolts.

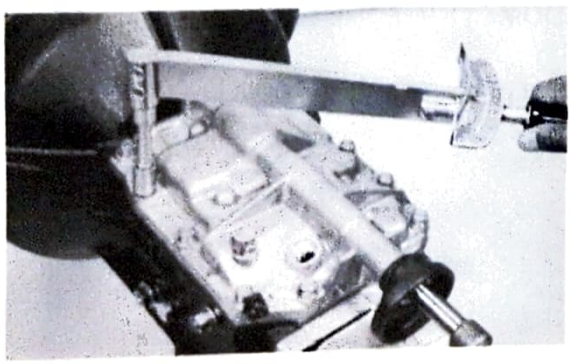
Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)



48. INSTALL TRANSMISSION CASE COVER WITH NEW GASKET (RN 4x2)

(a) Place each shift fork, hub sleeve and reverse idler gear in neutral.

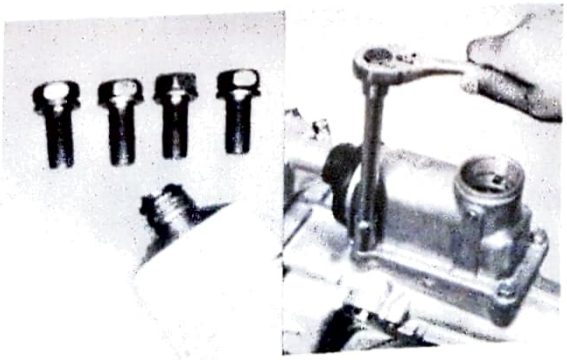
(b) Place the new gasket in position.



(c) Install the transmission case cover to the case.

(d) Tighten the case cover mounting bolts.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



49. INSTALL TRANSMISSION SHIFT LEVER RETAINER WITH NEW GASKET (RN 4x2)

(a) Install the boot on the shift and select lever shaft.

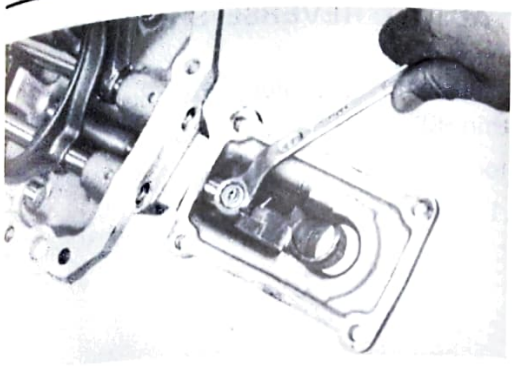
(b) Place the new gasket in position.

(c) Install the shift lever retainer.

(d) Apply liquid sealer to the mounting bolts and tighten the retainer.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

(e) Install the boot on the shift lever retainer.



50. INSTALL SHIFT LEVER RETAINER AND SHIFT LEVER HOUSING TO CASE COVER (RN 4x4)

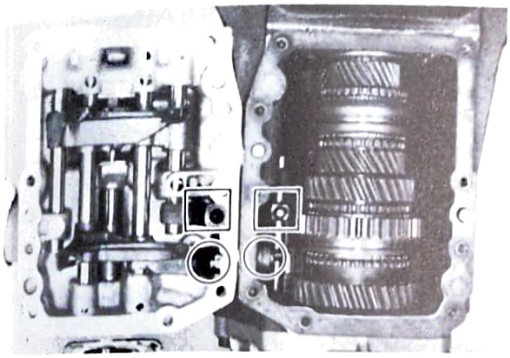
(a) Insert the shift lever retainer in the case cover.

(b) Install the shift lever housing to the shift & select lever shaft.

(c) Align the holes of the shaft and housing, and tighten the bolt.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)

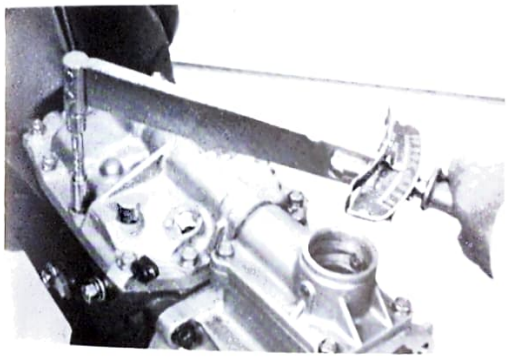
(d) Secure the bolt with the lock wire.



51. INSTALL TRANSMISSION CASE COVER AND SHIFT LEVER RETAINER WITH NEW GASKET (RN 4x4)

(a) Place each shift fork, hub sleeve and reverse idler gear in nuetral.

(b) Place the new gaskets in position on the case and adapter.



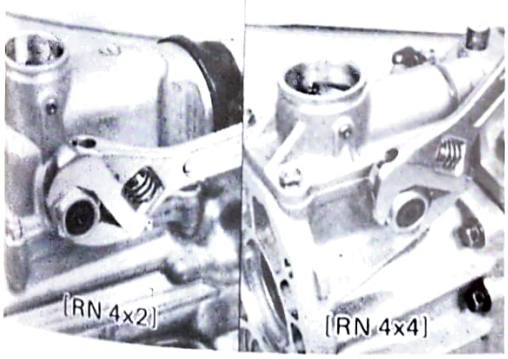
(c) Install the transmission case cover and shift lever retainer.

(d) Tighten the case cover mounting bolts.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

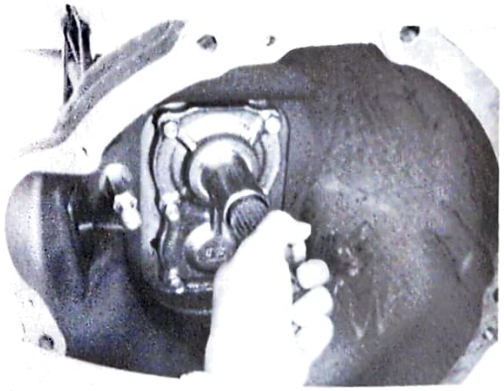
(e) Apply liquid sealer to the mounting bolts and tighten the retainer.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



52. INSTALL RESTRICT PIN TO SHIFT LEVER RETAINER

Install the resitrict pin to the shift lever retainer (RN 4x2) or adapter (RN 4x4).

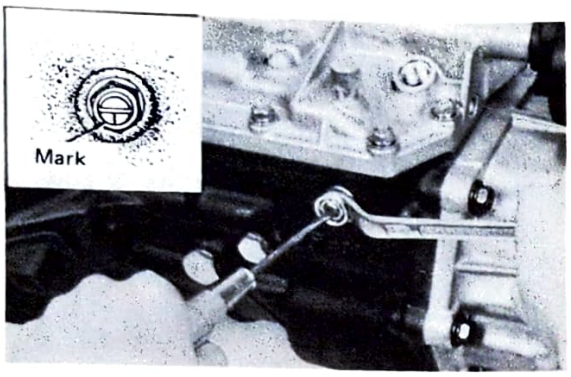


53. CHECK GEARS ROTATING CONDITION IN EACH SHIFT POSITION

(a) Check for smooth gear rotation.

(b) Check for smooth shift operation.

If abnormal noise comes from the reverse idler gear, adjust the reverse shift arm pivot position.

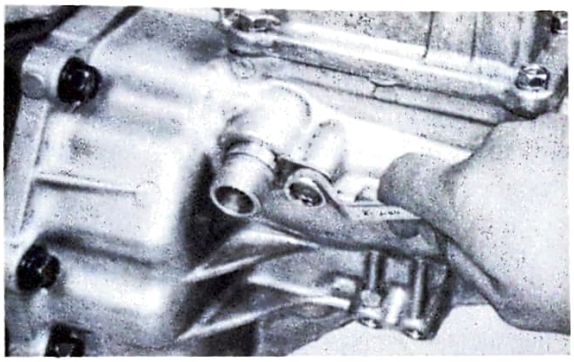


54. IF NECESSARY, ADJUST REVERSE SHIFT ARM PIVOT POSITION

(a) Corret the reverse shift arm pivot position by turning the pivot within 90°.

(b) Tighten the lock nut.

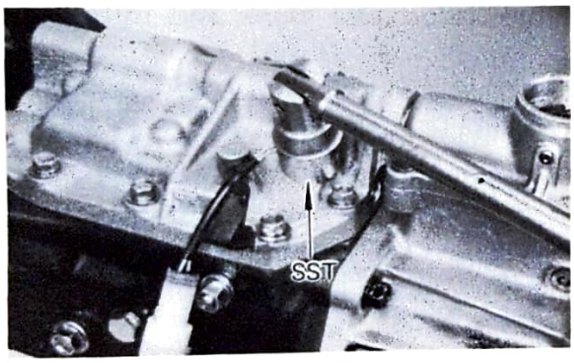
Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)



55. INSTALL SPEEDOMETER DRIVEN GEAR (RN 4x2)

Secure the gear with the lock plate and bolt.

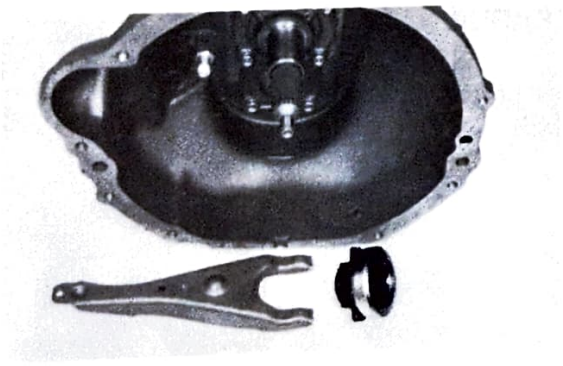
Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



56. INSTALL BACK-UP LIGHT SWITCH

Using a back-up light switch tool*, install the back-up light switch to the case cover.

*SST 09817-16010

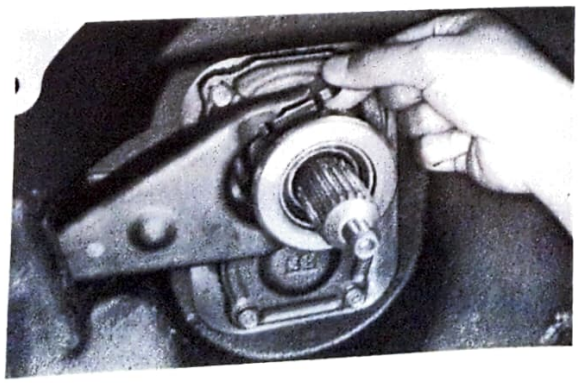


57. INSTALL CLUTCH RELEASE BEARING AND FORK

(a) Apply multipurpose grease to the release bearing front.

(b) Apply molybdenum disulphide lithium base grease to the following parts.

- Clutch disc spline
- Release bearing hub inside
- Release fork and hub contact points
- Release fork pivot point
- Release fork and push rod contact point

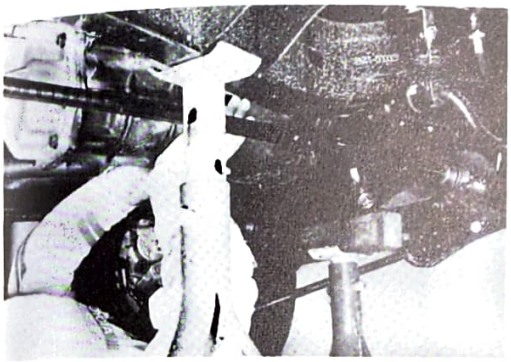


(c) Insert the fork into the boot and install to the clutch housing.

(d) Install the bearing hub with two clips.

INSTALLATION OF TRANSMISSION (RN4×2)

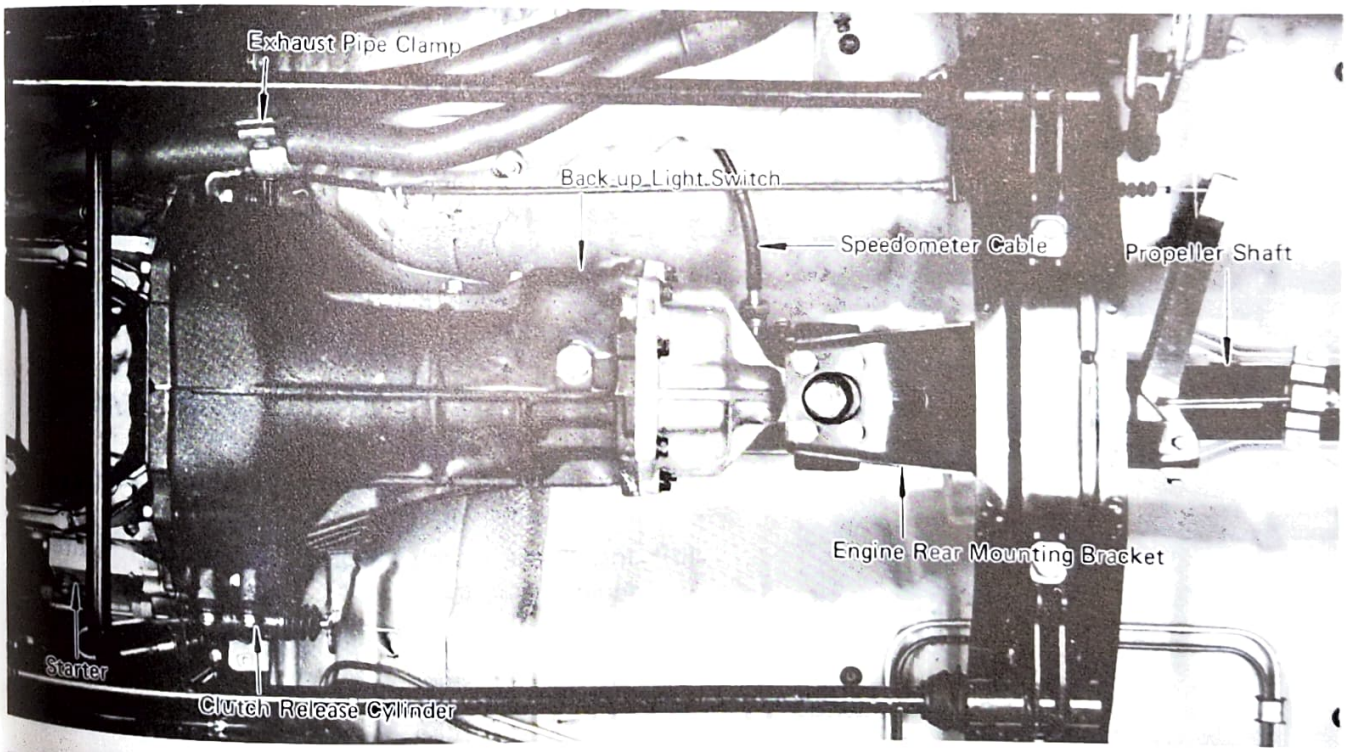
NOTE: For transmission (RN 4x4), refer to INSTALLATION OF TRANSFER on page 11-28.

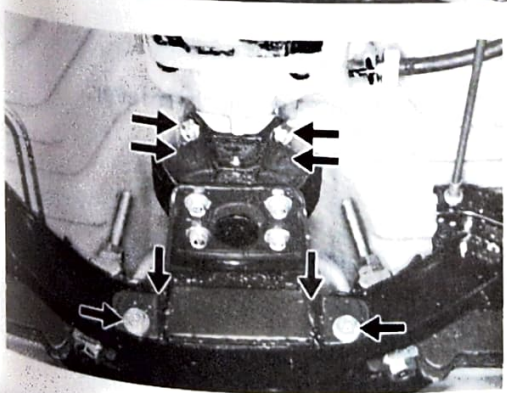


1. PLACE TRANSMISSION AT INSTALLATION POSITION, AND INSTALL TWO UPPER BOLTS

Insert the extension housing between the member and floor and then slide the transmission forward.

Align the input shaft spline with the clutch disc, and push the transmission fully into position.





2. INSTALL ENGINE REAR MOUNTING WITH BRACKET

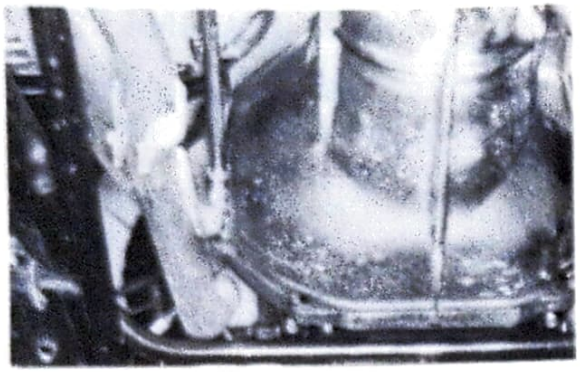
(a) Install the engine rear mounting with bracket to the support member. Tighten the four bolts.

Torque: 3.5 – 5.0 kg-m (26 – 36 ft-lb)

(b) Lower the transmission and rest it on the rear mounting.

(c) Install the four mounting bolts to the extension housing.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)

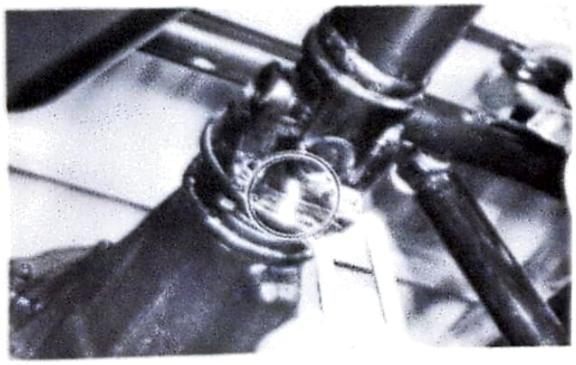


3. INSTALL REMAINING TRANSMISSION HOUSING BOLTS

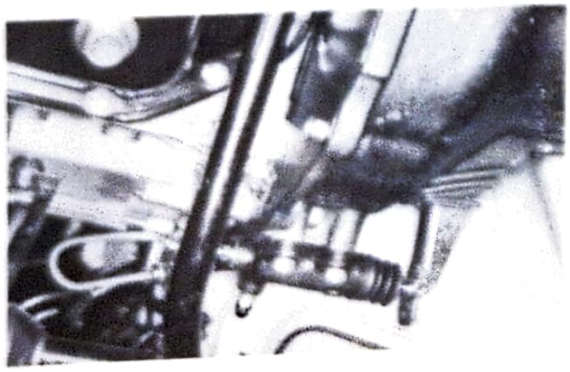
4. INSTALL EXHAUST PIPE CLAMP

5. CONNECT SPEEDOMETER CABLE

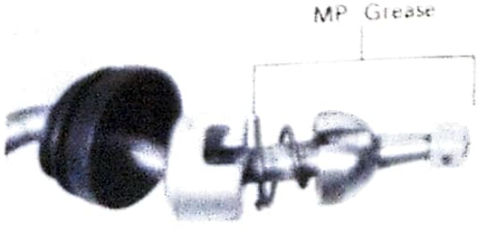
6. CONNECT BACK-UP LIGHT SWITCH WIRE



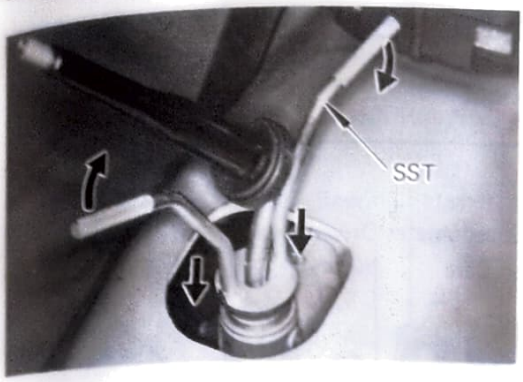
7. INSTALL PROPELLER SHAFT (See page 12-8)



8. INSTALL STARTER AND CLUTCH RELEASE CYLINDER
   (a) Install the starter and tighten the mounting bolt and nut together with the clutch hose bracket.
   (b) Install the clutch release cylinder and tighten the mounting bolts.



9. INSTALL SHIFT LEVER
   (a) Apply multipurpose grease to the shift lever.



(b) Using SST*, install the shift lever to the transmission.

*SST 09305-20012

10. FILL TRANSMISSION WITH OIL

Oil type: API GL-4 or GL-5
SAE 80W-90

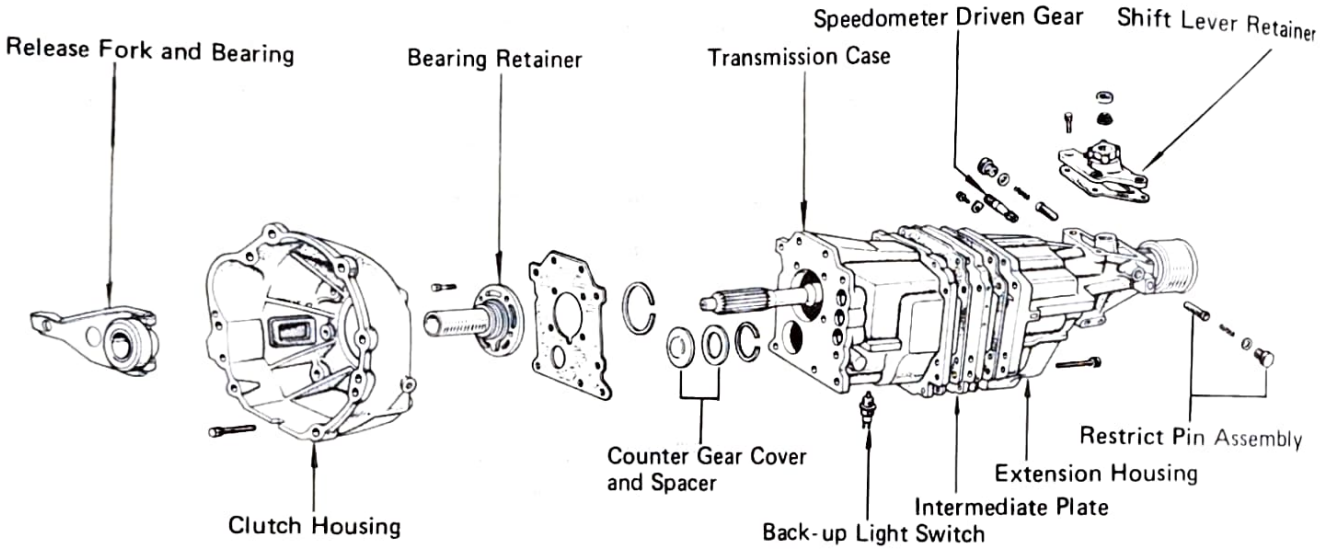
Quantity: L45 2.0 liters (2.1 US qts, 1.8 Imp.qts)
L48 2.0 liters (2.1 US qts, 1.8 Imp.qts)
L52 1.8 liters (1.9 US qts, 1.6 Imp.qts)

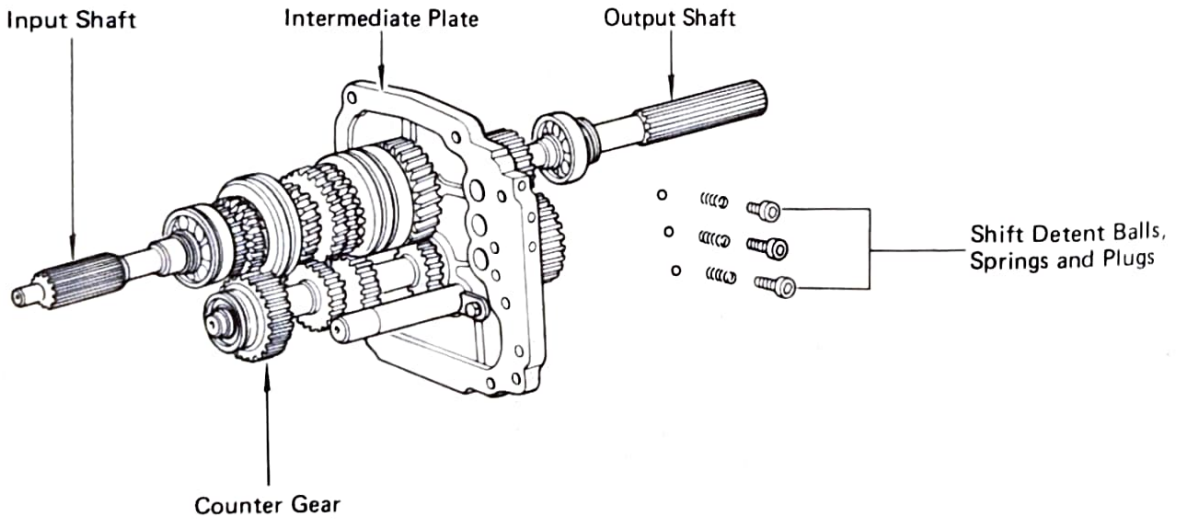
11. PERFORM ROAD TEST

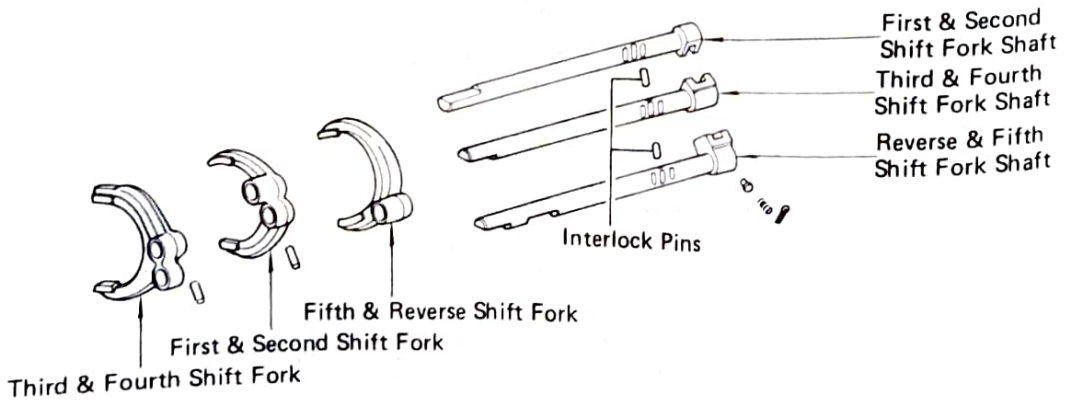
Check for abnormal noise and smooth operation.

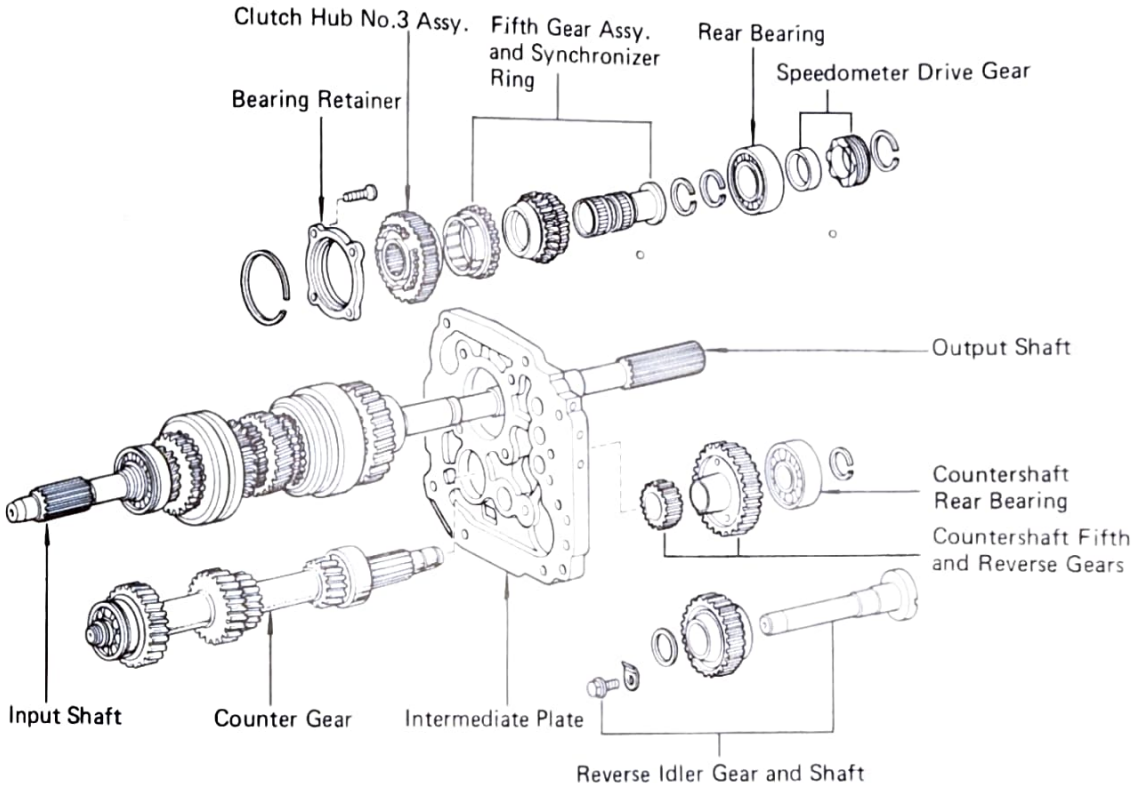
W50 TRANSMISSION

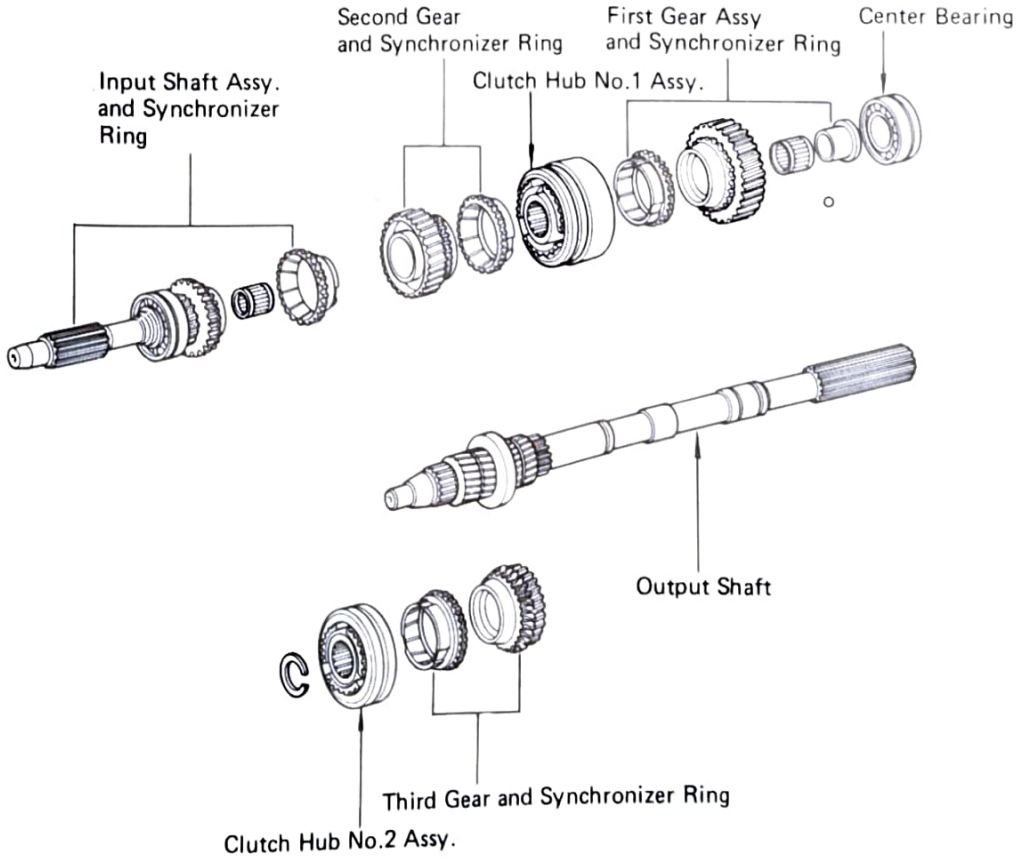
W50 5-Speed for RN4x2

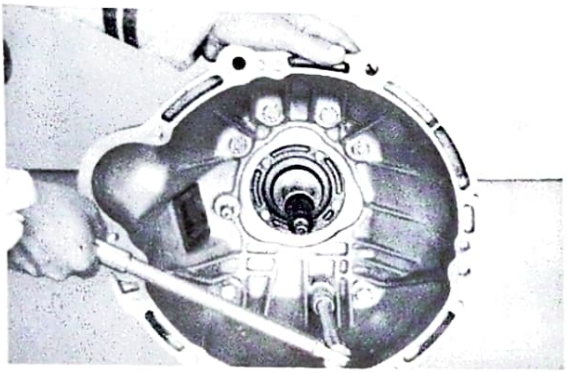







Clutch Hub No.3 Assy.
Fifth Gear Assy. and Synchronizer Ring
Rear Bearing
Speedometer Drive Gear
Bearing Retainer
Output Shaft
Countershaft Rear Bearing
Countershaft Fifth and Reverse Gears
Input Shaft
Counter Gear
Intermediate Plate
Reverse Idler Gear and Shaft


Second Gear and Synchronizer Ring
First Gear Assy and Synchronizer Ring
Center Bearing
Input Shaft Assy. and Synchronizer Ring
Clutch Hub No.1 Assy.
Output Shaft
Third Gear and Synchronizer Ring
Clutch Hub No.2 Assy.

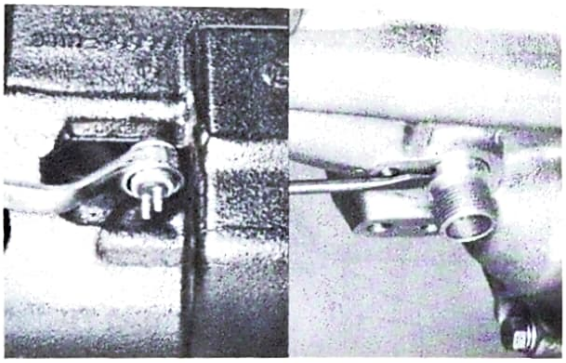


REMOVAL OF TRANSMISSION

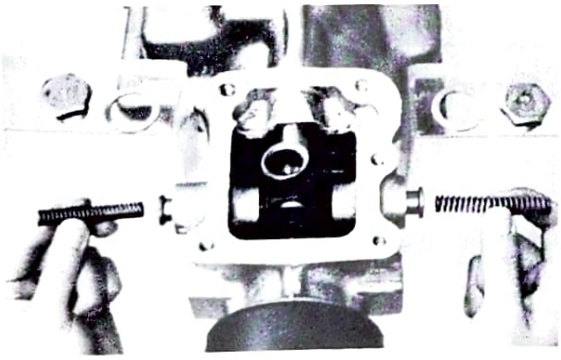
(See page 9-12)

DISASSEMBLY OF TRANSMISSION

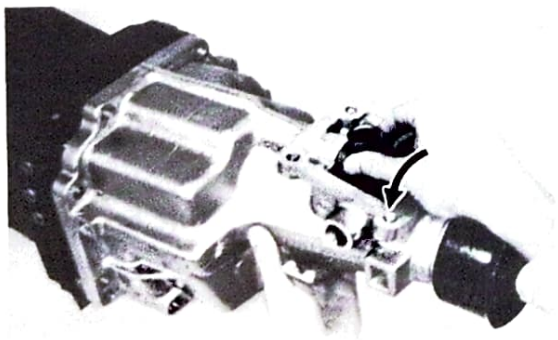
1. REMOVE CLUTCH HOUSING FROM TRANSMISSION CASE
   (a) Remove the clutch release bearing and fork from the clutch housing.
   (b) Remove the clutch housing from the transmission case.



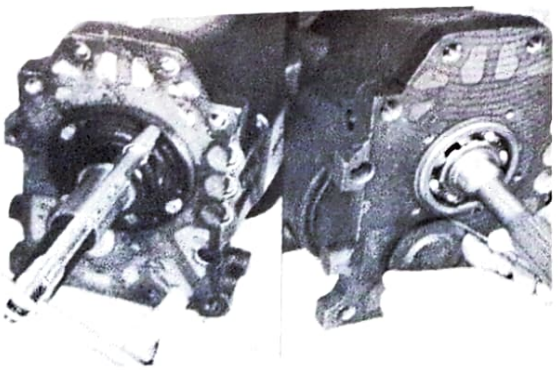
2. REMOVE BACK-UP LIGHT SWITCH
3. REMOVE SPEEDOMETER DRIVEN GEAR



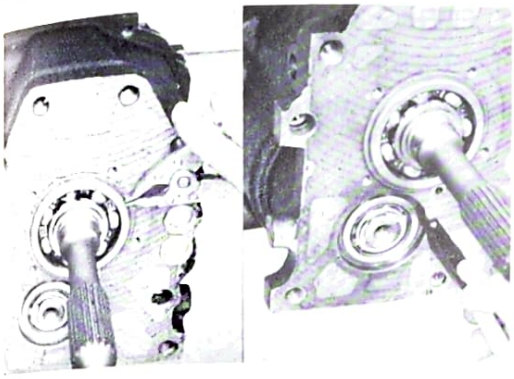
4. REMOVE SHIFT LEVER RETAINER
   Remove five bolts and pull off the retainer.
5. REMOVE RESTRICT PINS
   (a) Remove two caps and two washers.
   (b) Pull out two springs and two restrict pins.



6. REMOVE EXTENSION HOUSING
   (a) Remove eight bolts.
   (b) Turn the shift lever housing counterclockwise and tap housing with a plastic hammer.
   (c) Pull off the extension housing.

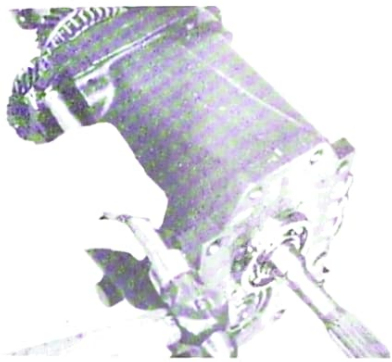


7. REMOVE FRONT BEARING RETAINER, GASKET AND COUNTER GEAR COVER
   (a) Remove four bolts and pry off the front bearing retainer.
   (b) Remove the front transmission gasket.
   (c) Using a screwdriver, pry off the counter gear cover.



8. REMOVE TWO BEARING SNAP RINGS

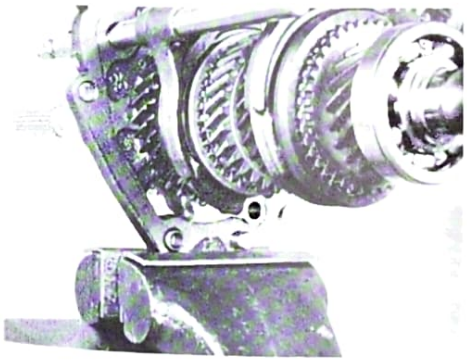
Using snap ring pliers, remove two snap rings.



9. SEPARATE INTERMEDIATE PLATE FROM TRANSMISSION CASE

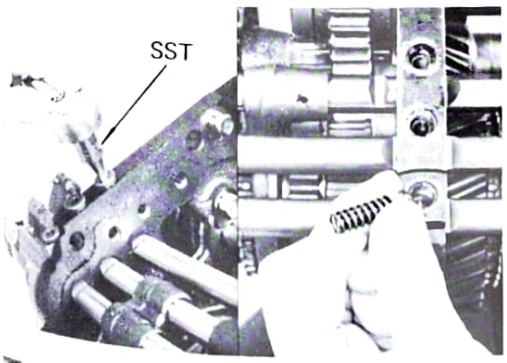
(a) Using a brass bar and hammer, carefully tap the intermediate plate.

(b) Pull the transmission case from the intermediate plate.



10. MOUNT TRANSMISSION IN VISE

CAUTION: Be sure to use soft jaws on the vise to prevent marring the intermediate plate.

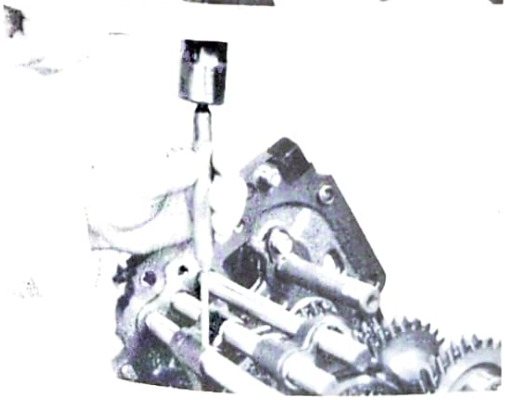


11. REMOVE THREE STRAIGHT SCREW PLUGS, SPRINGS AND BALLS

(a) Using an allen wrench*, remove the three plugs.

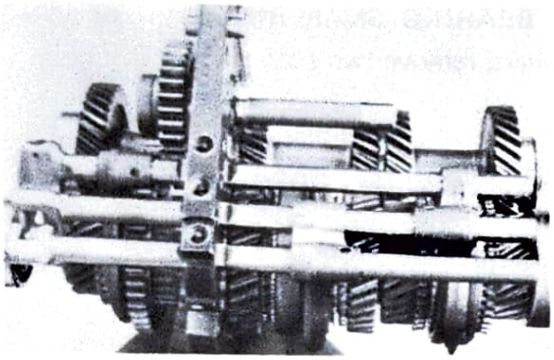
*SST 09313-30020 or Commercial wrench

(b) Using a magnet, remove the three springs and balls.



12. REMOVE SLOTTED SPRING PIN FROM EACH FORK

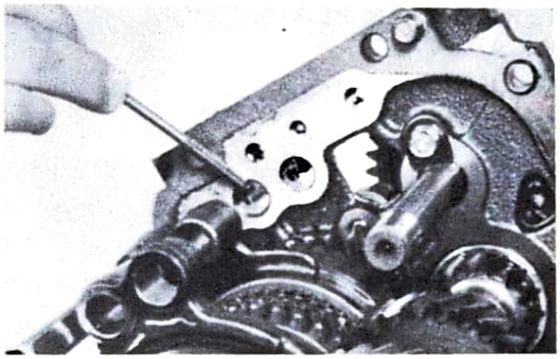
Using a punch and hammer, drive out each pin.



13. REMOVE SHIFT FORKS AND SHAFTS

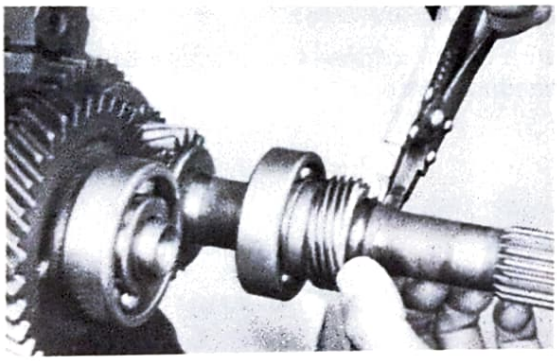
(a) Pull out the reverse shift shaft.

(b) Using a magnet, remove the interlock pin.



(c) Remove the two remaining shafts and interlock pins.

(d) Remove the three shift forks.



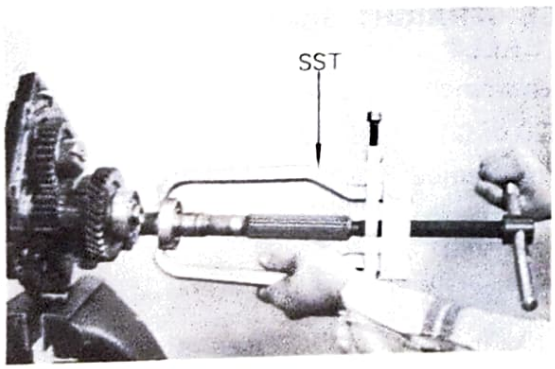
14. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

(b) Pull off the drive gear.

(c) Remove the locking ball.

(d) Remove the spacer.

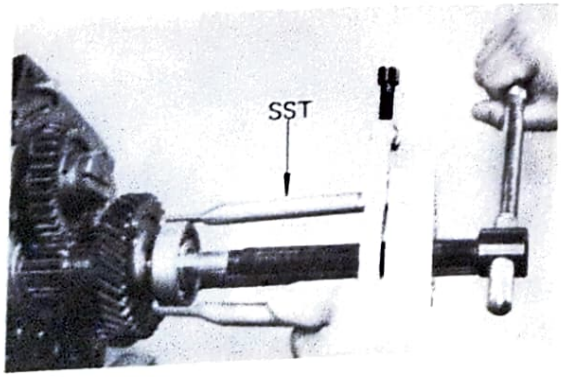


15. REMOVE OUTPUT SHAFT REAR BEARING AND SNAP RING

(a) Using a universal puller*, remove the bearing.

*SST 09950-20014

(b) Using snap ring pliers, remove the snap ring from the output shaft.

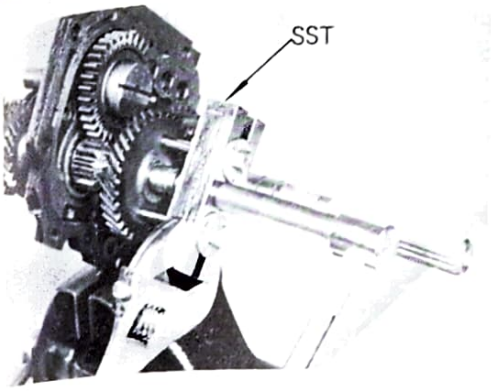


16. REMOVE COUNTER GEAR REAR BEARING

(a) Using snap ring pliers, remove the bearing snap ring.

(b) Using a universal puller*, remove the bearing.

*SST 09950-20014

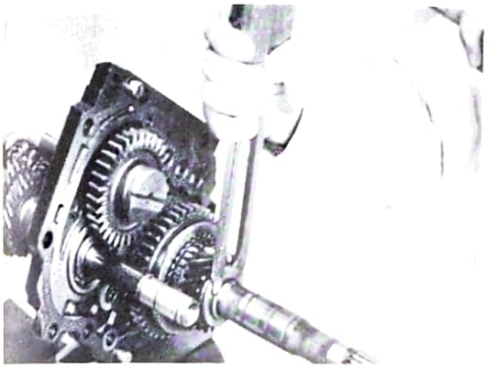


17. REMOVE COUNTERSHAFT FIFTH GEAR AND REVERSE GEAR

(a) Using a puller*, remove the fifth gear.

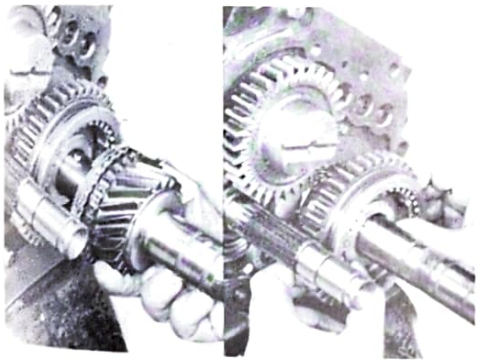
*SST 09213-60016 or Commercial puller

(b) Pull the reverse gear off by hand.



18. REMOVE FIFTH GEAR SNAP RING

Using two screwdrivers as shown, remove the snap ring.



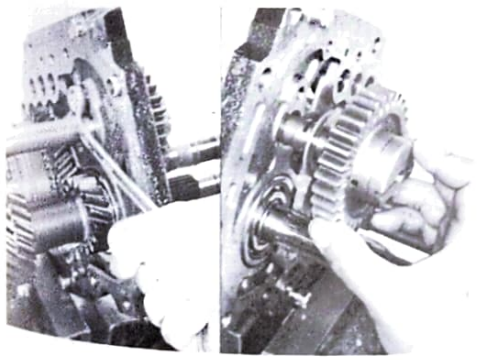
19. REMOVE FIFTH GEAR ASSEMBLY

(a) Pull the fifth gear off by hand with the inner race, two needle bearings and the synchronizer ring.

(b) Using a magnet, remove the inner race locking ball.

20. REMOVE CLUTCH HUB NO. 3 AND REVERSE GEAR

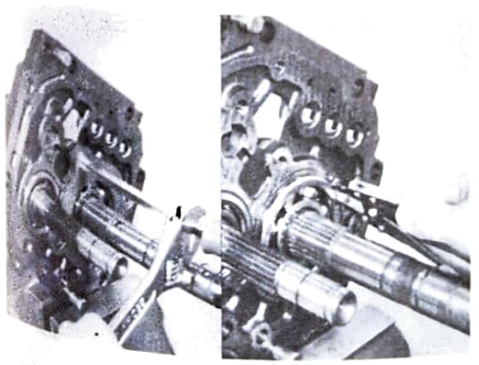
Pull off by hand.



21. REMOVE REVERSE IDLER GEAR AND SHAFT

(a) Remove the lock bolt and shaft stopper.

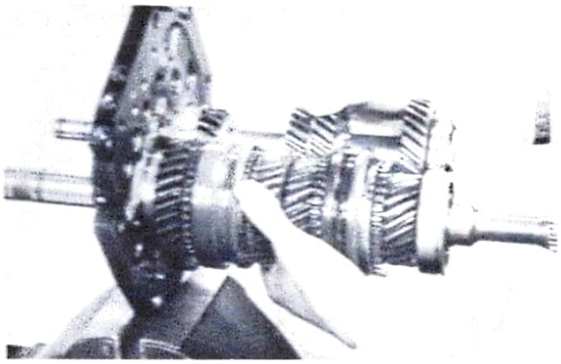
(b) Pull out the idler gear shaft with the gear and spacer.



22. REMOVE OUTPUT SHAFT CENTER BEARING RETAINER

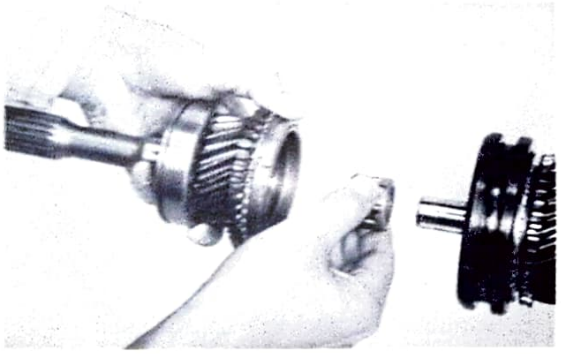
23. REMOVE SNAP RING

Using snap ring pliers, remove the snap ring.

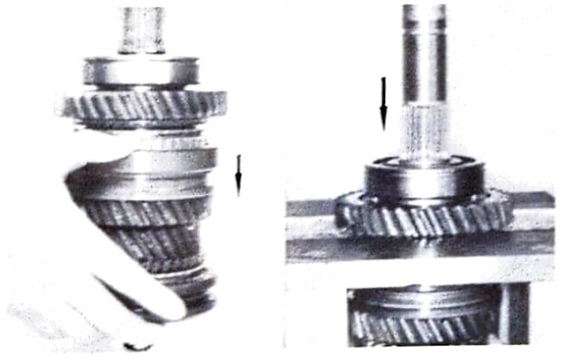


24. REMOVE OUTPUT SHAFT AND COUNTER GEAR AS A UNIT FROM INTERMEDIATE PLATE

If necessary, tap on the end of the shafts with a plastic hammer to loosen the unit.



25. REMOVE INPUT SHAFT ASSEMBLY FROM OUTPUT SHAFT



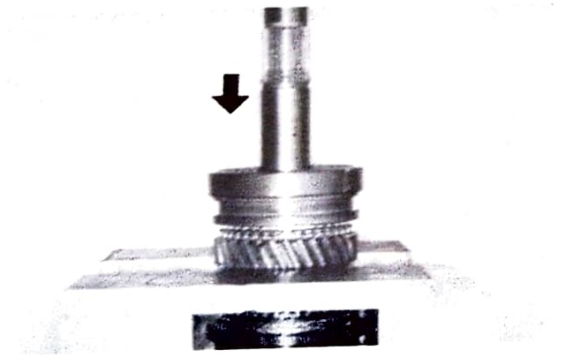
26. REMOVE OUTPUT SHAFT CENTER BEARING AND FIRST GEAR ASSEMBLY

(a) Shift the hub sleeve No. 1 onto the second gear.

(b) Using a press, remove the bearing.

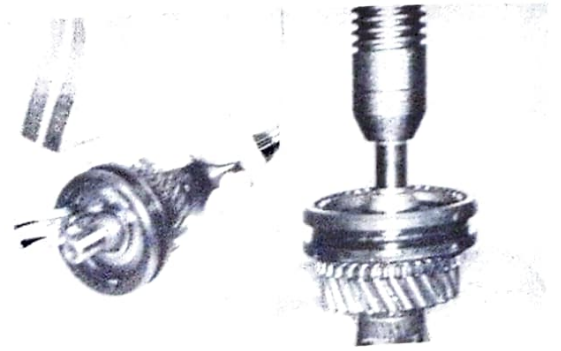
(c) Pull off the first gear with the needle roller bearing, inner race and the synchronizer ring.

(d) Remove the locking ball.



27. REMOVE CLUTCH HUB NO. 1, HUB SLEEVE AND SECOND GEAR

Using a press, remove the parts from the shaft as an assembly.



28. REMOVE CLUTCH HUB NO. 2, HUB SLEEVE AND THIRD GEAR

(a) Using snap ring pliers, remove the snap ring.

(b) Using a press, remove clutch hub No.2, synchronizer ring and third gear.

INSPECTION OF TRANSMISSION COMPONENTS

1. INSPECT OUTPUT SHAFT AND INNER RACES

(a) Inspect the output shaft and inner races for wear or damage.

(b) Using calipers, measure the output shaft flange thickness.

Minimum thickness: 4.8 mm (0.189 in.)

(c) Using calipers, measure the outer diameter of the shaft bushing surface.

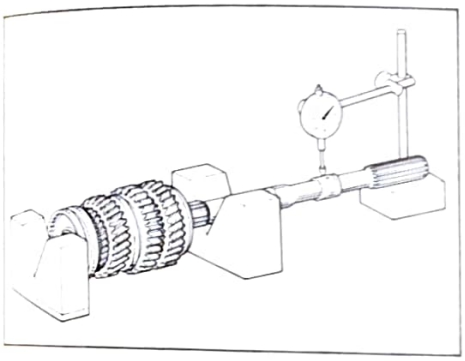
Minimum diameter: 40.8 mm (1.606 in.)

(d) Using calipers, measure each race flange thickness.

Minimum first gear race: 4.55 mm (0.1791 in.)
Minimum fifth gear race: 3.85 mm (0.1516 in.)

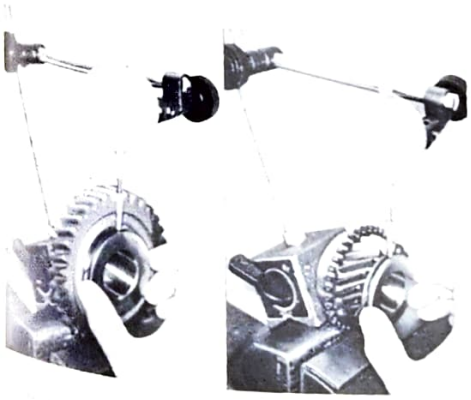
(e) Using a dial indicator, check the shaft runout.

Maximum runout: 0.05 mm (0.0020 in.)



2. INSPECT GEARS AND NEEDLE ROLLER BEARINGS

Check for wear or damage.



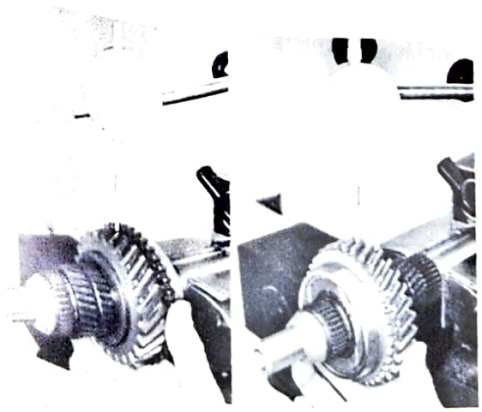
3. CHECK OIL CLEARANCE OF FIRST AND FIFTH GEARS

Using a dial indicator, measure the oil clearance between the gear and inner race with the needle roller bearing installed.

Standard clearance:

First gear	0.009 – 0.053 mm (0.0004 – 0.0021 in.)
Fifth gear	0.009 – 0.051 mm (0.0004 – 0.0020 in.)

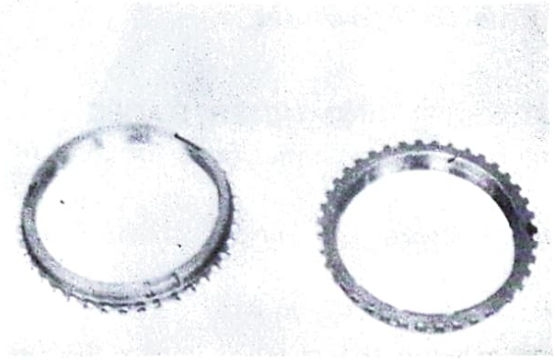
Maximum clearance: 0.06 mm (0.0024 in.)



4. CHECK OIL CLEARANCE OF SECOND AND THIRD GEARS

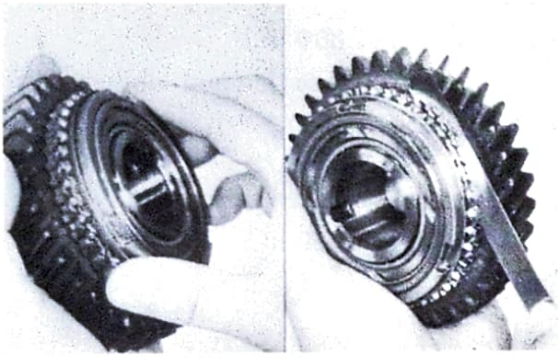
Using a dial indicator, measure the oil clearance between the gear and output shaft.

Standard clearance: 0.06 – 0.103 mm (0.0024 – 0.0041 in.)
Maximum clearance: 0.15 mm (0.0059 in.)



5. INSPECT SYNCHRONIZER RINGS

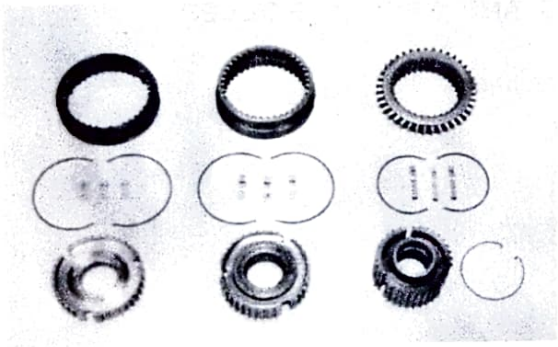
(a) Check the synchronizer rings for wear or damage.



(b) Turn the ring and push it in to check the braking action.

(c) Measure the clearance between the synchronizer ring back and the gear spline end.

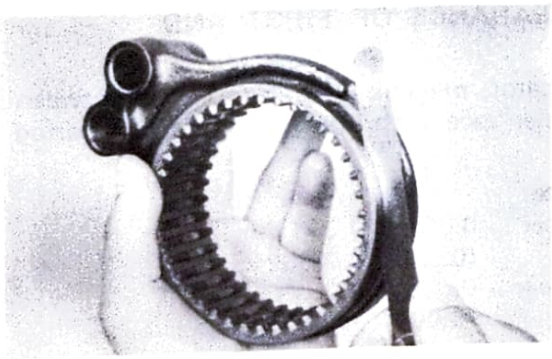
Minimum clearance: 0.8 mm (0.031 in.)



6. INSPECT CLUTCH HUBS SLEEVES, KEYS AND KEY SPRINGS

(a) Check parts for wear or damage.

(b) Check the rounded part of the keys for wear or damage.

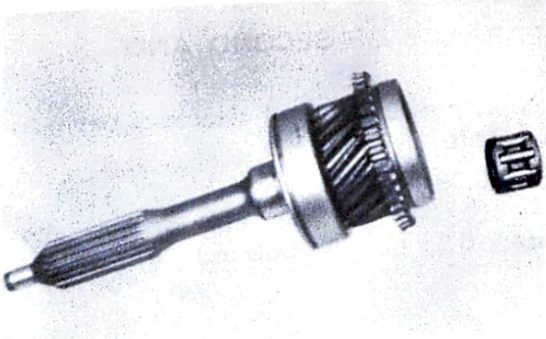


7. INSPECT SHIFT FORK AND HUB SLEEVE

(a) Check the contact surfaces for wear or damage.

(b) Measure the clearance between the hub sleeve and the shift fork.

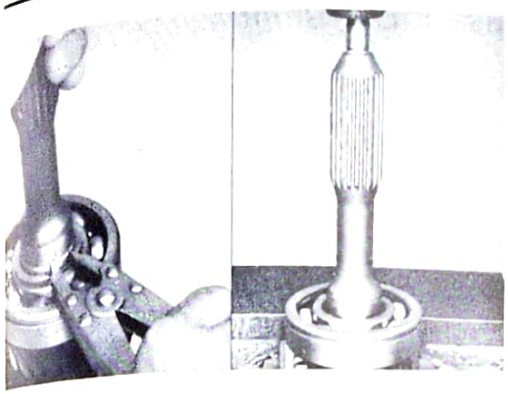
Maximum clearance: 1.0 mm (0.039 in.)



8. INSPECT INPUT SHAFT AND BEARING

Check for wear or damage.

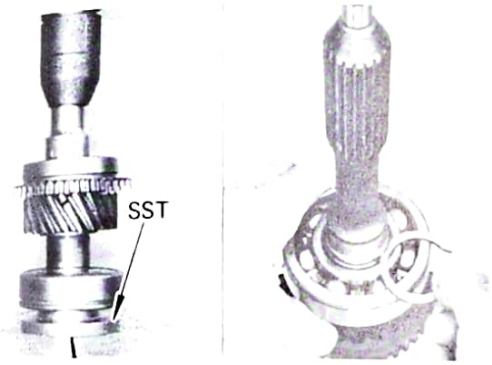
If bearing is worn or damaged, replace it.



9. IF NECESSARY, REPLACE INPUT SHAFT BEARING

(a) Using snap ring pliers, remove the snap ring.

(b) Using a press, remove the bearing.

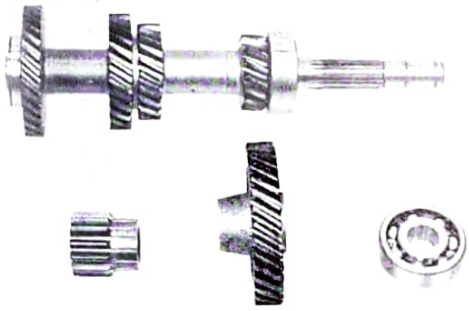


(c) Using a press and collar*, install a new bearing.

*SST 09506-30011 or Commercial collar

(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness	mm (in.)
0	2.05 – 2.10	(0.0807 – 0.0827)
1	2.10 – 2.15	(0.0827 – 0.0846)
2	2.15 – 2.20	(0.0846 – 0.0866)
3	2.20 – 2.25	(0.0866 – 0.0886)
4	2.25 – 2.30	(0.0886 – 0.0906)
5	2.30 – 2.35	(0.0906 – 0.0925)

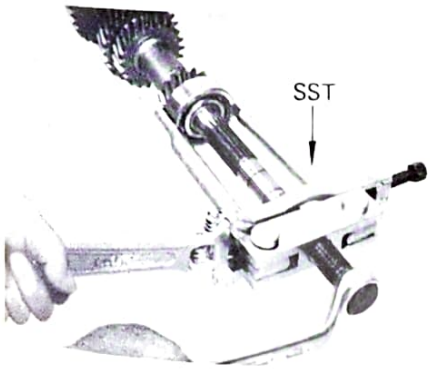


10. INSPECT COUNTER GEAR AND BEARING

(a) Check the gear teeth for wear or damage.

(b) Check the bearings and cylindrical roller bearings for wear or damage.

If bearings are worn or damaged, replace as necessary.



11. IF NECESSARY, REPLACE COUNTER GEAR BEARINGS

(a) Using snap ring pliers, remove the snap ring.

(b) Using a puller*, remove the front bearing and spacer.

*SST 09950-20014 or Commercial puller

NOTE: Before using a puller, make clearance for the puller claws by tapping between the bearing and gear with a chisel and hammer.

(c) Using a puller*, remove the center bearing and spacer.

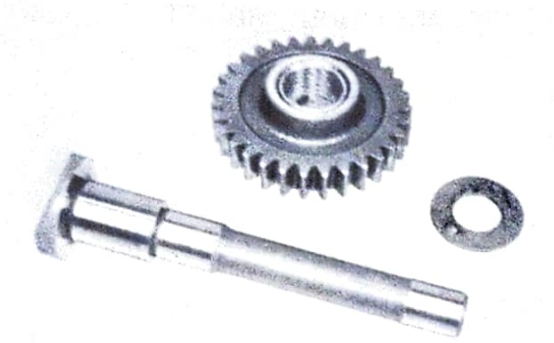
*SST 09950-20014 or Commercial puller

(d) Assemble each spacer for the front and center bearing with its tapered side toward the gear.

(e) Using a press and collar*, install the front and center bearings.

*SST 09515-10010 or Commercial collar

(f) Using snap ring pliers, install the snap ring to the counter gear front end.

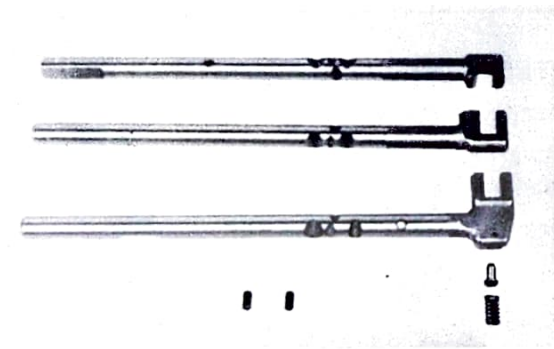


12. INSPECT REVERSE IDLER GEAR

Check the idler gear teeth and bushing for wear or damage.

13. INSPECT SHIFT FORKS

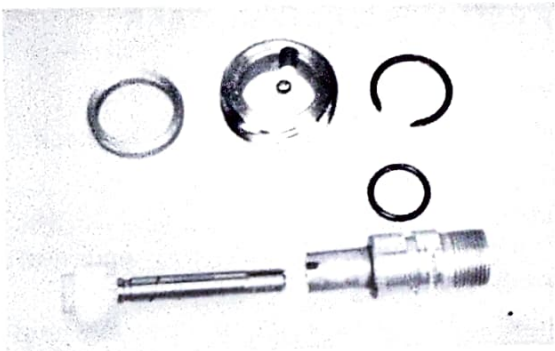
Check the shift forks for wear or damage.



14. INSPECT SHIFT FORK SHAFTS

(a) Check the sliding surfaces for wear or damage.

(b) Check the interlock pins for wear or damage.

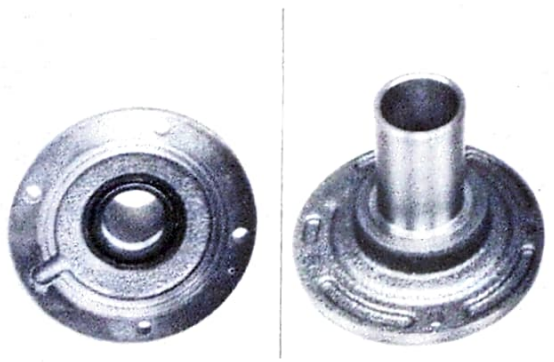


15. INSPECT SPEEDOMETER DRIVE GEAR AND DRIVEN GEAR

(a) Check gear teeth for wear or damage.

(b) Check gear shaft, oil seal and O-rings for wear or damage.

If the oil seal is worn or damaged, replace it.
(See page 9-34)



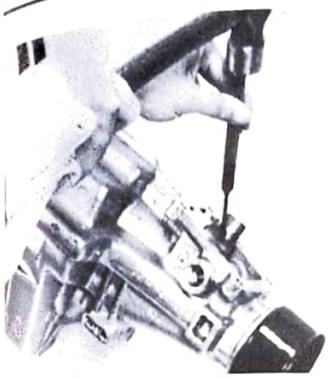
16. INSPECT FRONT BEARING RETAINER

Check the retainer and oil seal for wear or damage.

If the oil seal is worn or damaged, replace it as follows:

(a) Using a screwdriver, pry out the seal.

(b) Using a driver, drive in the new seal.

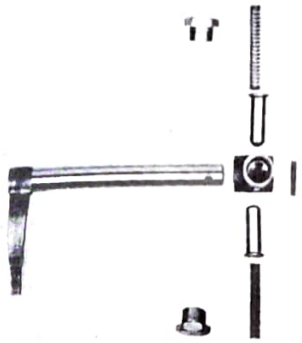


17. INSPECT EXTENSION HOUSING

(a) Check the shift lever housing and shaft for wear or damage.

If necessary, remove and replace parts as follows:

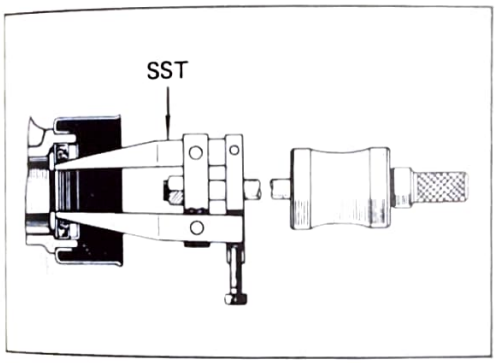
- Using a punch and hammer, drive out the slotted pin.
- Pull off the housing and slide out the shaft.



(b) Check the restrict pin assembly for wear or damage.

(c) Check the housing oil seal and bushing for wear or damage.

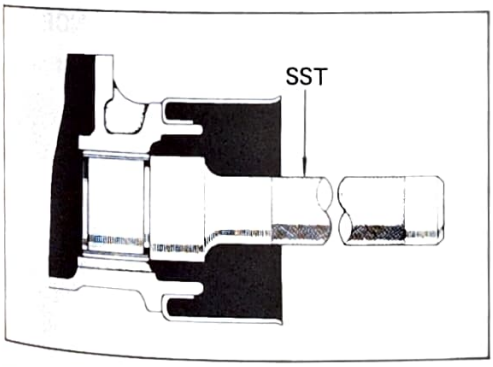
If worn or damaged, replace the oil seal and bushing.



18. IF NECESSARY, REPLACE OIL SEAL AND BUSHING

(a) Using a puller*, remove the oil seal.

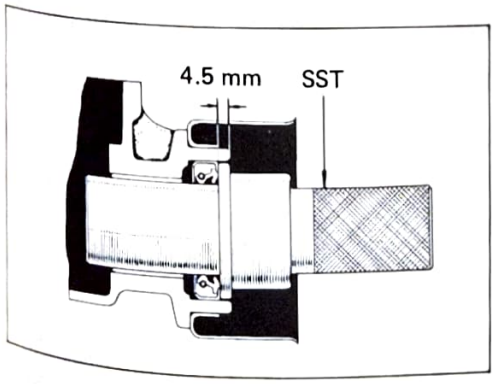
*SST 09308-00010 or Commercial puller or SST 09308-10010 with extension housing installed



(b) Heat the extension housing end to 80 – 100°C (176 – 212°F) in an oil bath.

(c) Using a bushing tool*, remove the bushing and install a new one.

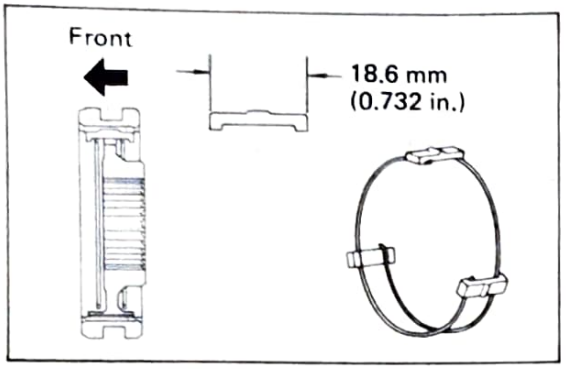
*SST 09307-30010 or Commercial tool



(d) Using the transmission oil plug*, drive in the new oil seal to the correct depth.

Oil seal depth: 4.5 mm (0.177 in.)

*SST 09325-20010 or Commercial driver

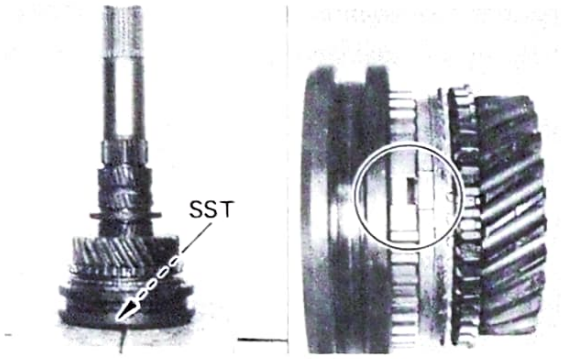


ASSEMBLY OF TRANSMISSION
(See illustration on page 9-56)

1. INSERT CLUTCH HUB NO. 2 INTO HUB SLEEVE

(a) Install the clutch hub No. 2 and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.



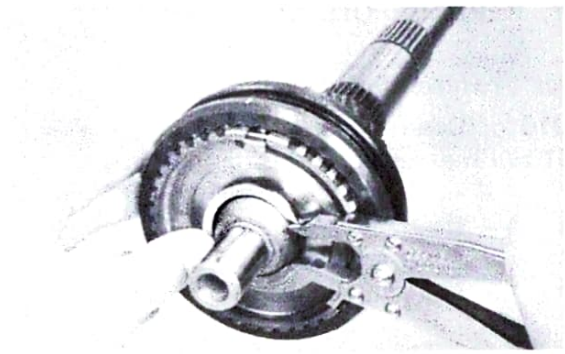
2. INSTALL THIRD GEAR AND CLUTCH HUB NO. 2 ON OUTPUT SHAFT

(a) Apply multipurpose grease to the shaft.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Using a press and collar*, install the third gear and clutch hub No. 2.

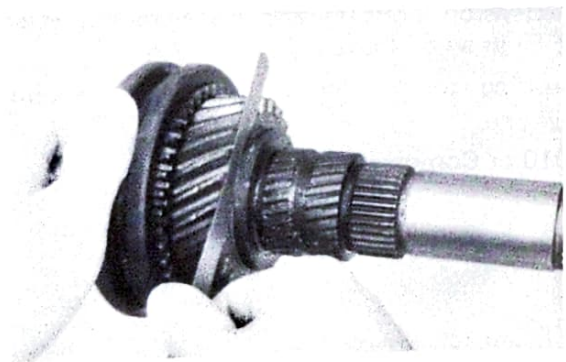
*SST 09506-30011 or Commercial collar



3. INSTALL SNAP RING

Select a snap ring, which will allow 0 – 0.05 mm (0 – 0.0020 in.) axial play.

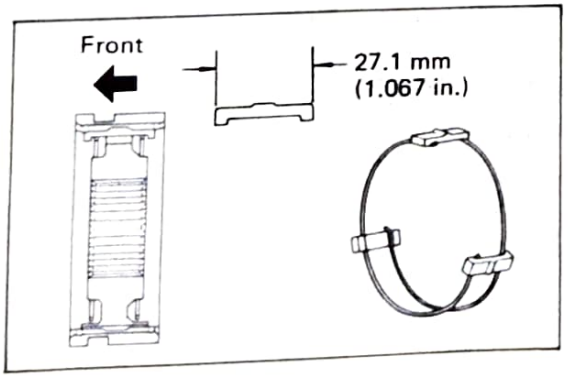
Mark	Thickness	mm (in.)
(None)	2.00 – 2.05	(0.0787 – 0.0807)
0	2.05 – 2.10	(0.0807 – 0.0827)
1	2.10 – 2.15	(0.0827 – 0.0846)
2	2.15 – 2.20	(0.0846 – 0.0866)
3	2.20 – 2.25	(0.0866 – 0.0886)
4	2.25 – 2.30	(0.0886 – 0.0906)



4. MEASURE THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the third gear thrust clearance.

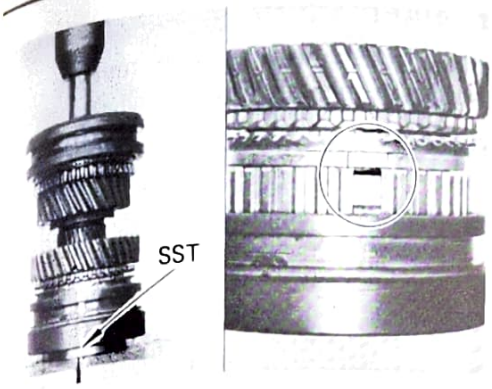
Standard clearance: 0.15 – 0.25 mm (0.0059 – 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)



5. INSERT CLUTCH HUB NO. 1 INTO HUB SLEEVE

(a) Install the clutch hub No. 1 and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.



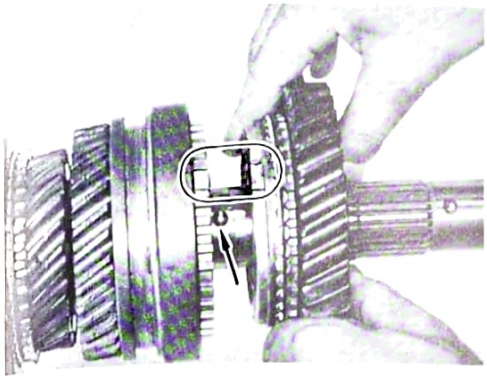
6. INSTALL SECOND GEAR AND CLUTCH HUB No. 1

(a) Apply multipurpose grease to the shaft.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Using a press and collar*, install the second gear and clutch hub No. 1.

*SST 09506-30011 or Commercial collar



7. INSTALL LOCKING BALL AND FIRST GEAR ASSEMBLY

(a) Install the locking ball in the shaft.

(b) Apply multipurpose grease to the bearing.

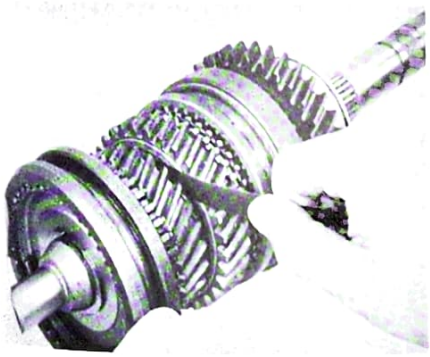
(c) Assemble the first gear, synchronizer ring, needle bearing and bearing inner race.

(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys.

8. INSTALL OUTPUT SHAFT CENTER BEARING

Using a press and collar*, install the bearing on the output shaft with the outer race snap ring groove toward the rear.

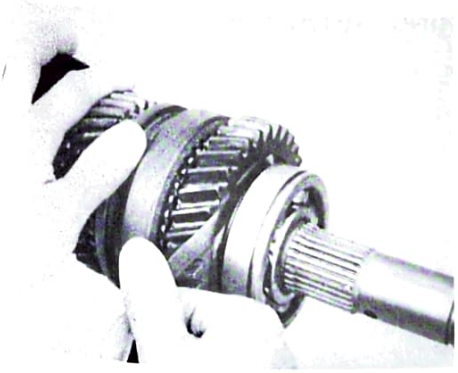
*SST 09506-30011 or Commercial collar



9. MEASURE SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the second gear thrust clearance.

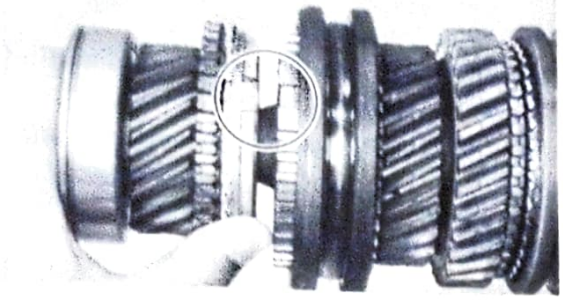
Standard clearance: 0.15 – 0.25 mm (0.0059 – 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)



10. MEASURE FIRST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the first gear thrust clearance.

Standard clearance: 0.15 – 0.25 mm (0.0059 – 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)

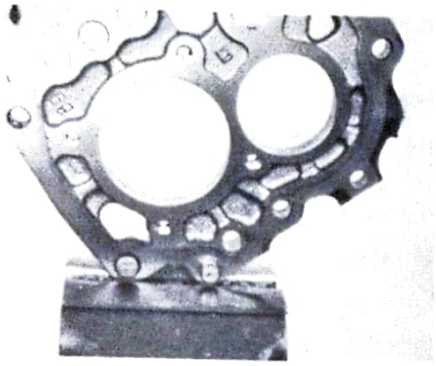


11. INSTALL INPUT SHAFT

(a) Coat the needle roller bearing with multipurpose grease and install it in the input shaft.

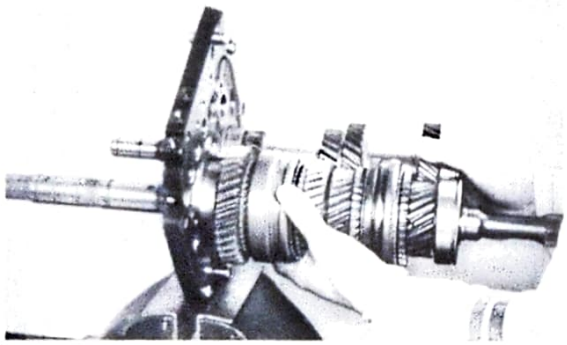
(b) Install the synchronizer ring on the input shaft.

(c) Install the input shaft on the output shaft with the synchronizer ring slots aligned with the shifting keys.



12. CLAMP INTERMEDIATE PLATE IN VISE

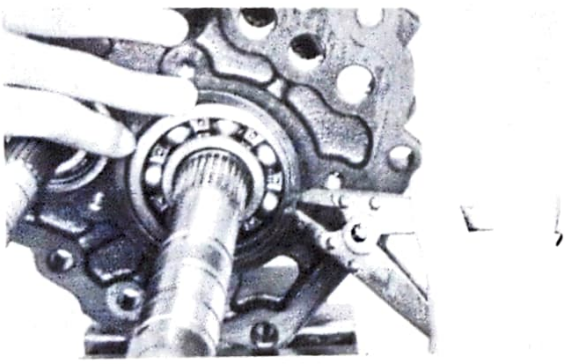
CAUTION: Use soft jaws to prevent marring the intermediate plate.



13. INSTALL OUTPUT SHAFT AND COUNTERSHAFT GEARS

(a) Align the output shaft and countershaft gear together.

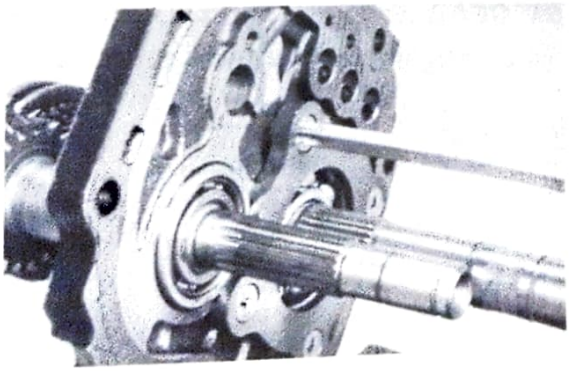
(b) Install the unit into the intermediate plate.



14. INSTALL OUTPUT SHAFT REAR BEARING SNAP RING

Using snap ring pliers, install the bearing snap ring.

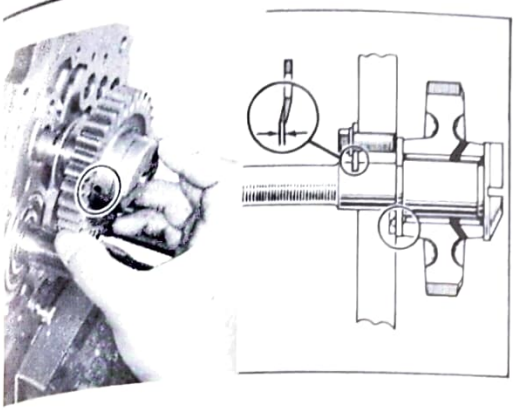
NOTE: Be sure the snap ring is flush with the intermediate plate surface.



15. INSTALL BEARING RETAINER

Install the bearing retainer and tighten the screws.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

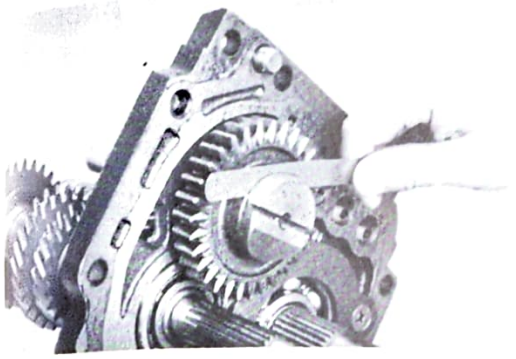


16. INSTALL REVERSE IDLER GEAR AND SHAFT

(a) Assemble idler gear with oil hole toward the rear, and the spacer on the idler gear shaft.

(b) Insert the assembly with the tab on the spacer fitted into the notch on the intermediate plate.

(c) Install the reverse idler shaft stopper.

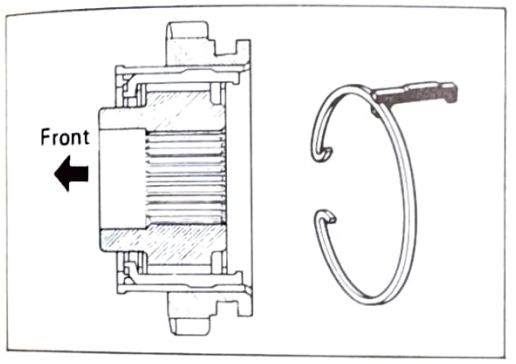


17. MEASURE REVERSE IDLER GEAR THRUST CLEARANCE

Using a feeler gauge, measure the reverse idler gear thrust clearance.

Standard clearance: 0.15 – 0.25 mm (0.0059 – 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)

If clearance is excessive, replace the spacer.

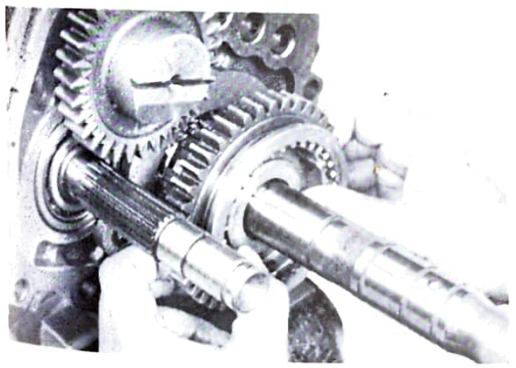


18. INSERT CLUTCH HUB NO. 3 INTO REVERSE GEAR

(a) Install the clutch hub No. 3 and shifting keys to the reverse gear.

(b) Install the shifting key springs under the shifting keys.

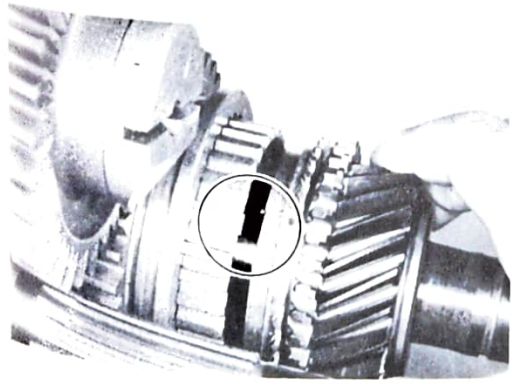
(c) Fit the snap ring in the grooves of the hub and the shifting keys.



19. INSTALL CLUTCH HUB NO. 3 AND REVERSE GEAR ON OUTPUT SHAFT

(a) Push on the shaft until it rests against the inner race of the bearing in the intermediate plate.

(b) Install the clutch hub No. 3 with reverse gear on the output shaft.



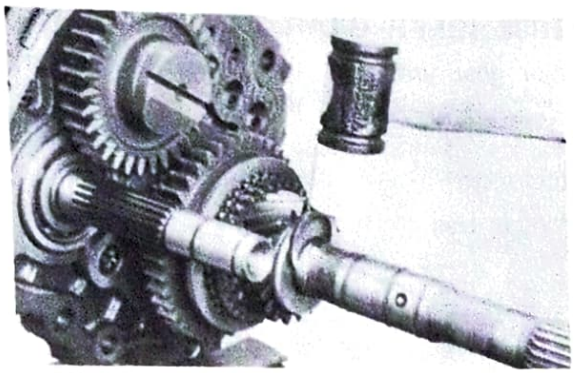
20. INSTALL FIFTH GEAR ASSEMBLY

(a) Install inner race locking ball.

(b) Apply multipurpose grease to the needle bearings.

(c) Assemble fifth gear, synchronizer ring, needle bearing and inner race.

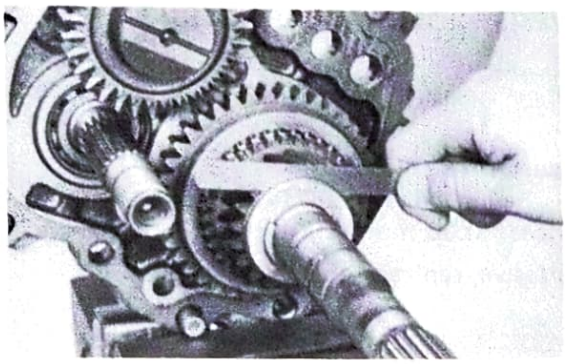
(d) Install fifth gear assembly with synchronizer ring slots aligned with the shifting keys.



21. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	1.89–1.94(0.0744–0.0764)	8	2.31–2.36(0.0909–0.0929)
2	1.95–2.00(0.0768–0.0787)	9	2.37–2.42(0.0933–0.0953)
3	2.01–2.06(0.0791–0.0811)	10	2.43–2.48(0.0957–0.0976)
4	2.07–2.12(0.0815–0.0835)	11	2.49–2.54(0.0980–0.1000)
5	2.13–2.18(0.0839–0.0858)	12	2.55–2.60(0.1004–0.1024)
6	2.19–2.24(0.0862–0.0882)	13	2.61–2.66(0.1028–0.1047)
7	2.25–2.30(0.0886–0.0906)		

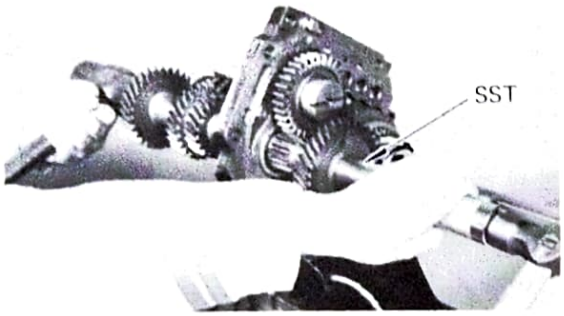


22. MEASURE FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the fifth gear thrust clearance.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.30 mm (0.0118 in.)



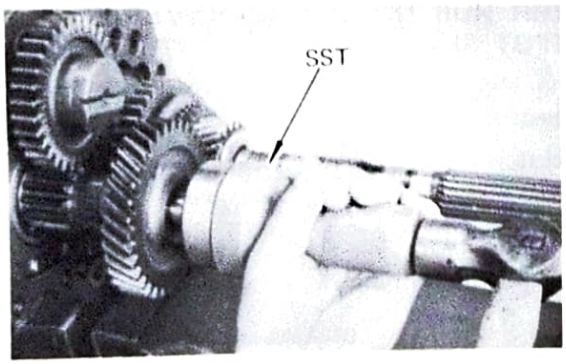
23. INSTALL COUNTERSHAFT REVERSE GEAR AND FIFTH GEAR

(a) Install the reverse gear on the countershaft.

(b) Using a driver*, drive the fifth gear on the shaft.

*SST 09612-22010 or Commercial driver

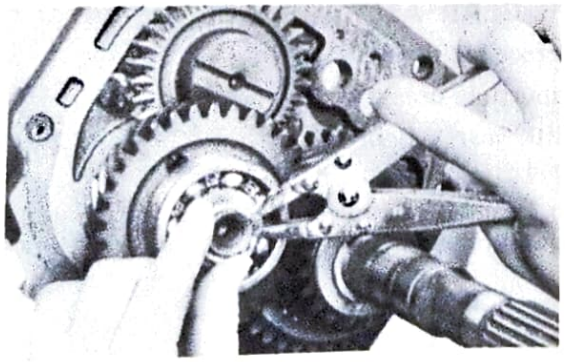
NOTE: When installing the fifth gear, support the counter shaft in front with a 3 – 5 lb hammer or equivalant.



24. INSTALL COUNTER GEAR REAR BEARING

Using a bearing driver*, drive the bearing on the shaft.

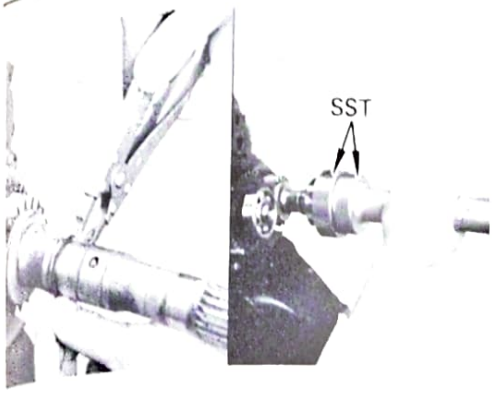
*SST 09310-35010 or Commercial driver



25. INSTALL COUNTER GEAR REAR BEARING SNAP RING

Select a snap ring that will allow minimum axial play.

Mark	Thickness	mm (in.)
1	2.00 – 2.05	(0.0787 – 0.0807)
2	1.80 – 1.85	(0.0709 – 0.0728)
3	1.60 – 1.65	(0.0630 – 0.0650)
4	1.40 – 1.45	(0.0551 – 0.0571)



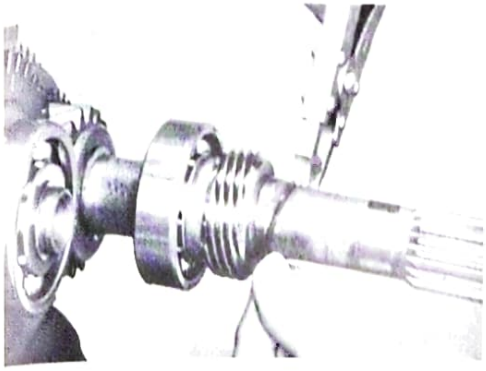
26. INSTALL OUTPUT SHAFT REAR BEARING SNAP RING

Using snap ring pliers, install the snap rings on the output shaft.

27. INSTALL OUTPUT SHAFT REAR BEARING

Using a bearing drivers*, drive the bearing flush against the snap ring.

*SST 09515-20010 and 09309-35010
or Commercial drivers



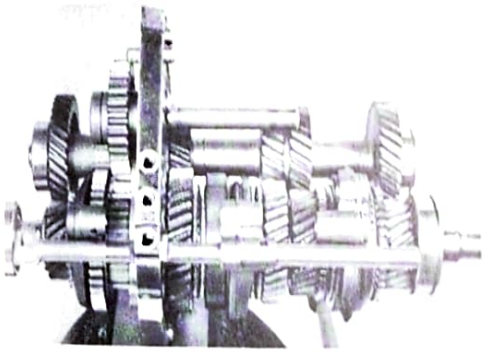
28. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the spacer.

(b) Install the locking ball.

(c) Install the drive gear.

(d) Using snap ring pliers, install the outer snap ring.

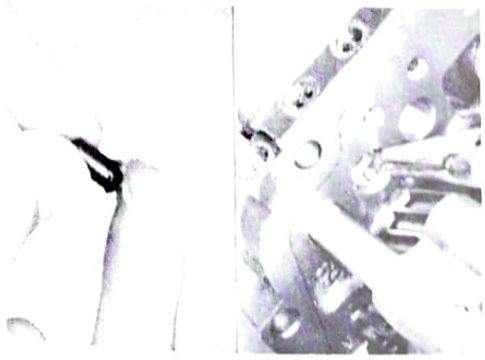


29. PLACE SHIFT FORKS INTO THEIR RESPECTIVE HUB SLEEVES

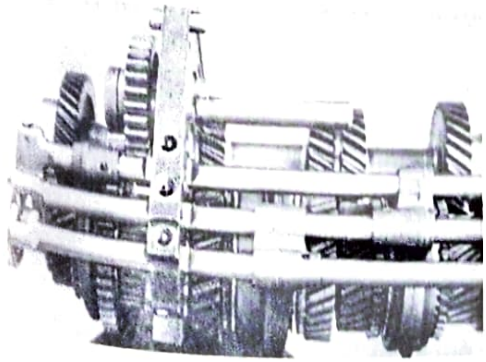
30. INSTALL FIRST & SECOND SHIFT SHAFT

(a) Install the first & second shift shaft through the intermediate plate and first & second shift fork.

(b) Turn the shaft so that the three grooves are facing toward the ball detents.



31. INSTALL INTERLOCK PIN



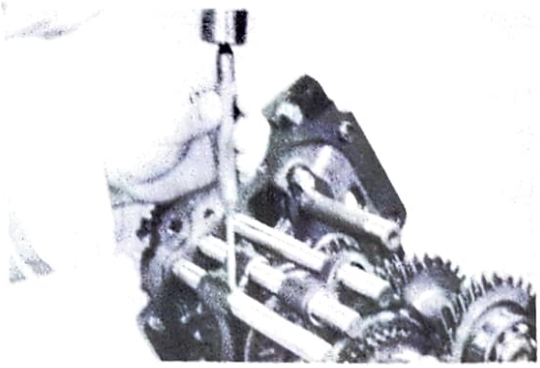
32. INSTALL THIRD & FOURTH SHIFT SHAFT

(a) Install the third & fourth shift shaft through the plate, first & second shift fork and third & fourth shift fork.

(b) Align the shaft and install the interlock pin.

33. INSTALL REVERSE SHIFT SHAFT

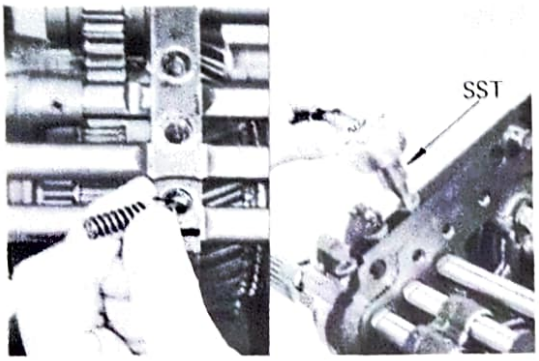
(a) Install the reverse shift shaft through the fifth & reverse shift fork, intermediate plate and third & fourth shift fork.



34. INSTALL SLOTTED SPRING PINS

(a) Align the pin holes in the forks with the holes in the shafts.

(b) Using a pin punch, drive in the spring pins until they are flush with the forks.



35. INSTALL THREE BALLS, SPRINGS AND PLUGS

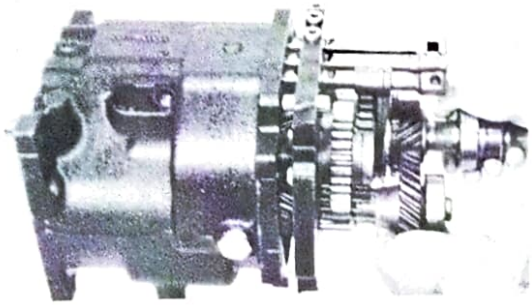
(a) Apply liquid sealer to the plugs.

(b) Using an allen wrench*, tighten the plugs.

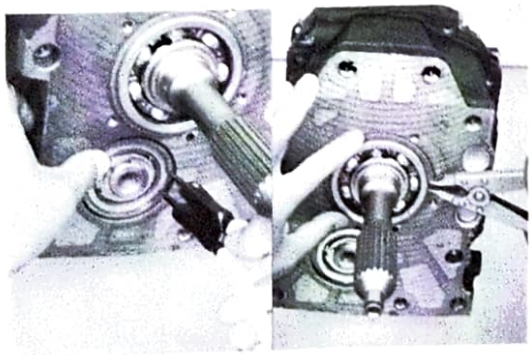
*SST 09313-30020 or Commercial wrench

(c) Torque the plugs.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)

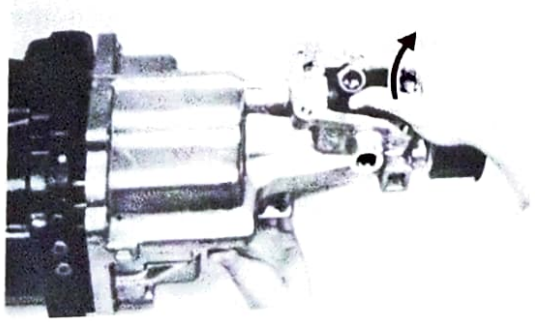


36. INSTALL TRANSMISSION CASE WITH NEW GASKET



37. INSTALL INPUT SHAFT BEARING AND COUNTERSHAFT BEARING FRONT SNAP RINGS

Using snap ring pliers, install the snap rings.



38. INSTALL EXTENSION HOUSING WITH NEW GASKET

(a) Place the gasket in position on the intermediate plate.

(b) Slide the extension housing on the transmission until a gap of 20 – 30 mm (0.79 – 1.18 in.) remains.

(c) Turn the lever housing clockwise to connect the select lever with the shift fork shafts.

(d) Install and torque the housing bolts.

Torque: 4.0 – 4.5 kg-m (29 – 32 ft-lb)

39. MEASURE COUNTERSHAFT CLEARANCE

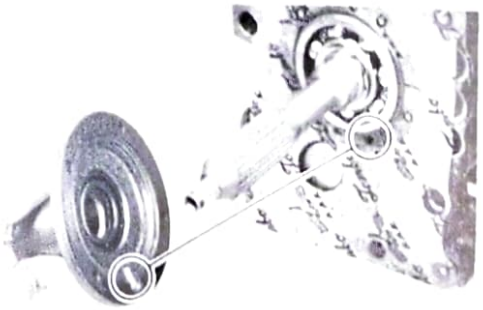
(a) Push the countershaft firmly toward the rear.

(b) Using calipers, measure the space between the bearing and the transmission case surface.

(c) Select the correct spacer and install the spacer and cover.

Spacer thickness

Clearance mm (in.)	Mark	Thickness mm (in.)
2.87 – 2.99 (0.1130 – 0.1177)	•	1.95 – 2.05 (0.0768 – 0.0807)
3.00 – 3.09 (0.1181 – 0.1217)	••	2.10 – 2.20 (0.0827 – 0.0866)
3.10 – 3.19 (0.1220 – 0.1256)	•••	2.25 – 2.35 (0.0886 – 0.0925)
3.20 – 3.29 (0.1260 – 0.1295)	••••	2.40 – 2.50 (0.0945 – 0.0984)



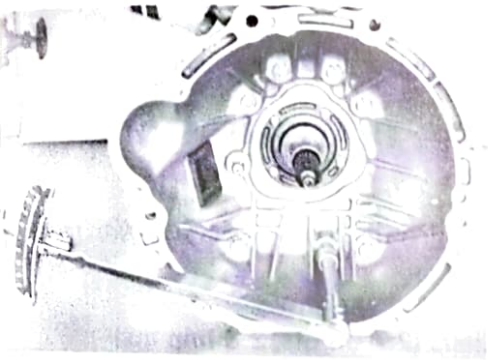
40. INSTALL BEARING RETAINER WITH NEW GASKET

(a) Place the new gasket in position.

(b) Apply multipurpose grease to the oil seal.

(c) Align the oil return hole with the groove and install the retainer. Torque the retainer.

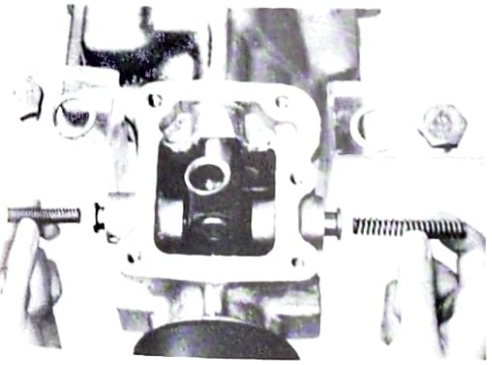
Torque: 1.0 – 1.4 kg-m (8 – 10 ft-lb)



41. INSTALL CLUTCH HOUSING

Install the housing with seven bolts and torque the bolts.

Torque: 1.0 – 1.4 kg-m (8 – 10 ft-lb)



42. INSTALL RESTRICT PINS

(a) Install the restrict pins and springs with short spring on the left side.

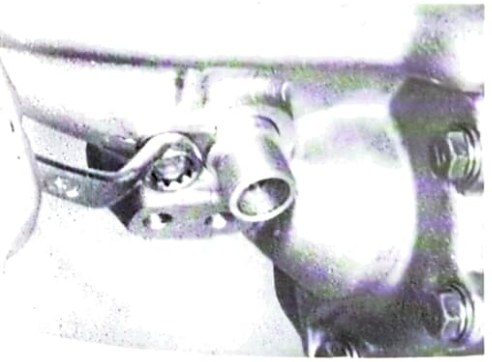
(b) Install and torque the caps with washers.

Torque: 3.7 – 4.5 kg-m (27 – 32 ft-lb)

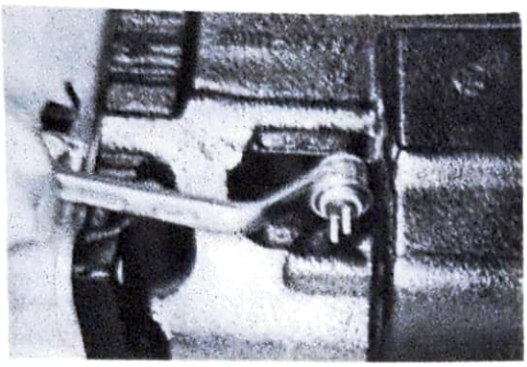
43. INSTALL OIL BAFFLE AND SHIFT LEVER RETAINER

Install with four bolts and torque the bolts.

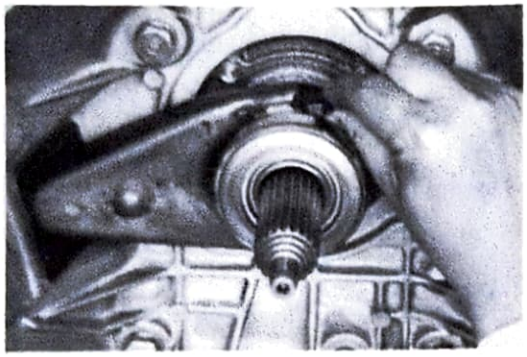
Torque: 1.5 – 2.0 kg-m (11 – 14 ft-lb)



44. INSTALL SPEEDOMETER DRIVEN GEAR



45. INSTALL BACK-UP LIGHT SWITCH



46. INSTALL CLUTCH RELEASE BEARING AND FORK
   (a) Apply multipurpose grease to the release bearing front.
   (b) Apply molybdenum disulphide lithium base grease to the following parts.
      - Clutch disc spline
      - Release bearing hub inside
      - Release fork and hub contact points
      - Release fork pivot point
      - Release fork and push rod contact point
   (c) Insert the fork into the boot and install to the clutch housing.
   (d) Install the bearing hub with two clips.

INSTALLATION OF TRANSMISSION (See page 9-53)

NOTE: After installing the transmission fill with gear oil.

Oil type: API GL-4 or GL-5
SAE 75W-90 or 80W-90
Quantity: 2.6 liters (2.7 US qts, 2.3 Imp.qts)

AUTOMATIC TRANSMISSION

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TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated	Replace fluid	10-5
	Torque converter faulty	Replace torque converter	10-29
	Transmission faulty	Disassemble and inspect transmission	10-29
Vehicle does not move in either any forward range or reverse range	Manual linkage out of adjustment	Adjust linkage	10-6
	Valve body or primary regulator faulty	Inspect valve body	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29
Vehicle does not move in any range	Park lock pawl faulty	Inspect park pawl	10-24
	Valve body or primary regulator faulty	Inspect valve body	10-19
	Torque converter faulty	Replace torque converter	10-29
	Converter drive plate broken	Replace torque converter	10-29
	Oil pump intake screen blocked	Clean screen	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29
Shift lever position incorrect	Manual linkage out of adjustment	Adjust linkage	10-6
	Manual valve and lever faulty	Inspect valve body	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29
Harsh engagement into any drive range	Throttle cable out of adjustment	Adjust throttle cable	10-6
	Valve body or primary regulator faulty	Inspect valve body	10-19
	Accumulator pistons faulty	Inspect accumulator pistons	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29
Delayed 1-2, 2-3 or 3-4 up-shift, or down-shifts from 4-3 or 3-2 then shifts back to 4 or 3	Throttle cable out of adjustment	Adjust throttle cable	10-6
	Throttle cable and cam faulty	Inspect throttle cable and cam	10-22
	Governor faulty	Inspect governor	10-27
	Valve body faulty	Inspect valve body	10-19
Slip on 1-2, 2-3 or 3-4 up-shift, or slip or shudder on take-off	Manual linkage out of adjustment	Adjust linkage	10-6
	Throttle cable out of adjustment	Adjust throttle cable	10-6
	Valve body faulty	Inspect valve body	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29
Drag, binding, or tie-up on 1-2, 2-3 or 3-4 up-shift	Manual linkage out of adjustment	Adjust linkage	10-6
	Valve body faulty	Inspect valve body	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29
Harsh down-shift	Throttle cable out of adjustment	Adjust throttle cable	10-6
	Throttle cable and cam faulty	Inspect throttle cable and cam	10-22
	Accumulator pistons faulty	Inspect accumulator pistons	10-19
	Valve body faulty	Inspect valve body	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29

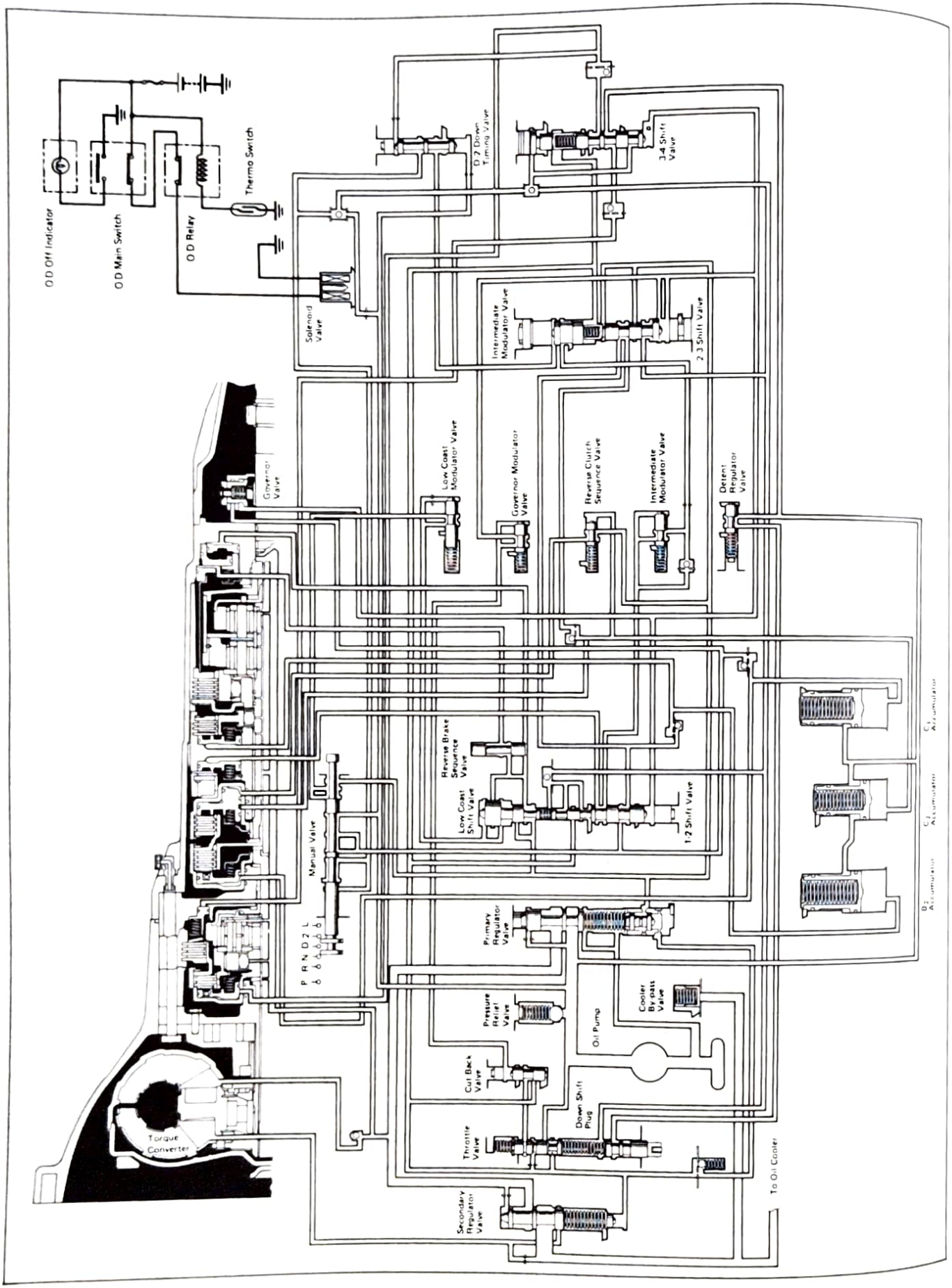
TROUBLESHOOTING (CONT'D)

Problem	Possible cause	Remedy	Page
No down-shift when coasting	Governor faulty	Inspect governor	10-28
	Valve body faulty	Inspect valve body	10-19
Down-shift occurs too fast or too late while coasting	Throttle cable out of adjustment	Adjust throttle cable	10-6
	Throttle cable faulty	Inspect throttle cable	10-22
	Governor faulty	Inspect governor	10-27
	Valve body faulty	Inspect valve body	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29
No 4-3, 3-2 or 2-1 kick-down	Throttle cable out of adjustment	Adjust throttle cable	10-6
	Governor faulty	Inspect governor	10-27
	Valve body faulty	Inspect valve body	10-19
No engine braking in "2" range	Valve body faulty	Inspect valve body	10-19
	Transmission faulty	Disassemble and inspect transmission	10-29
Vehicle does not hold in "P"	Manual linkage out of adjustment	Adjust linkage	10-6
	Parking lock pawl cam and spring faulty	Inspect cam and spring	10-24

SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Oil pressure gauge	09992-00092	To measure oil pressure
Oil seal puller	09308-10010 or Commercial	To remove front and rear oil seals (ON-VEHICLE REPAIR)
	09308-00010 or Commercial	To remove rear oil seal
Transmission oil plug	09325-20010 or Commercial	To install rear oil seal
Pitman arm puller	09610-20011	To remove front pump
Automatic transmission service set	09350-20013 or 00002-00223	To overhaul transmission
Oil seal replacer	09350-20013 or Commercial	To install front oil seal and manual shaft oil seal
Hook	09921-00010 or Commercial	To remove speedometer driven gear oil seal
Oil seal replacer	09201-60011 or Commercial	To install speedometer driven gear oil seal

HYDRAULIC CIRCUIT (A43D)



MAINTENANCE

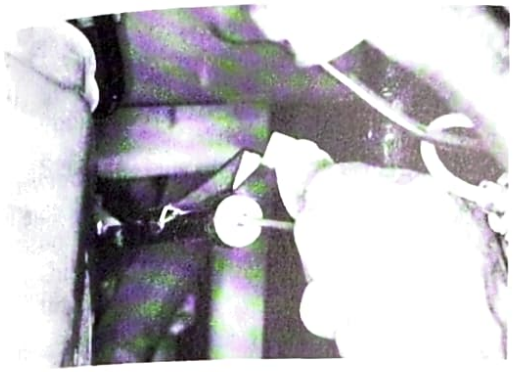
1. PERFORM REQUIRED MAINTENANCE REGULARLY

The following maintenance is essential:

(a) Regularly check the fluid level.

(b) Regularly check the fluid condition.

(c) Change the fluid every 30,000 miles.

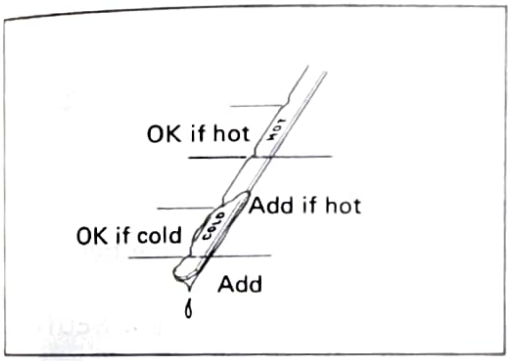


2. CHECK FLUID LEVEL

NOTE: The vehicle must have been driven so that the engine and transmission are at normal operating temperature.

(a) With the engine idling, shift the selector into each gear from PARK to LOW and return to PARK.

(b) Pull out the transmission dipstick and wipe it clean.



(c) Push it fully into the tube.

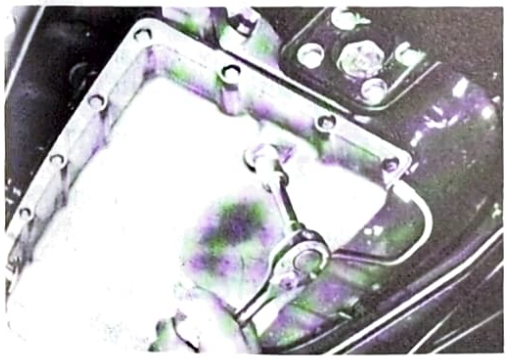
(d) Pull it out and check that the fluid level is in the HOT range.

If low, add fluid.

CAUTION: Do not overfill.

3. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it.



4. REPLACE FLUID

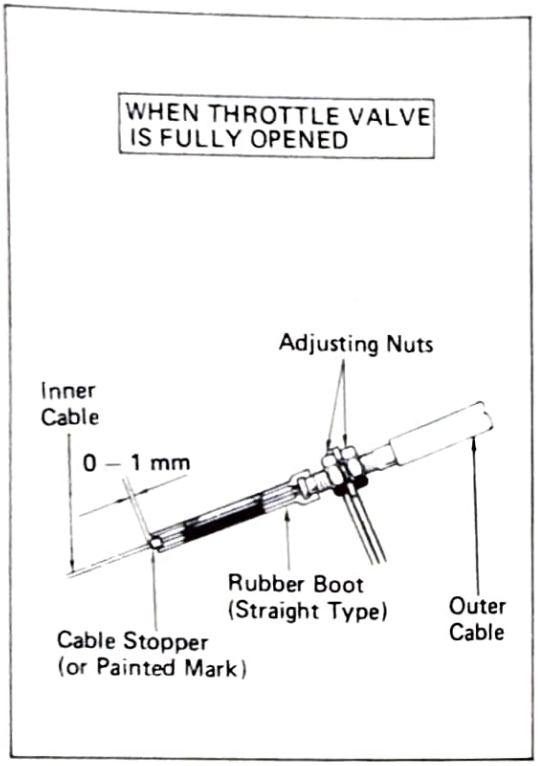
(a) Remove the drain plug and drain all fluid from the transmission.

(b) Remove the pan and inspect for particles that would indicate excessive wear or damage. Clean and install the pan.

(c) Clean and install the drain plug. (Use a new gasket if necessary.) Tighten the plug.

Torque: 1.5 – 2.0 kg-m (11 – 14 ft-lb)

(d) Add 2 quarts of ATF and check the fluid level. Add fluid, as necessary, to bring the level to proper range.



ADJUSTMENTS

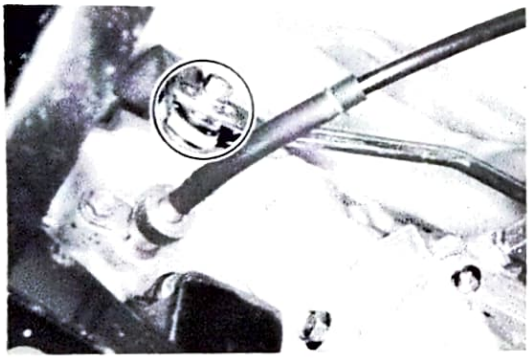
ADJUSTMENT OF THROTTLE CABLE

1. REMOVE AIR CLEANER
2. PUSH ON ACCELERATOR CONNECTING ROD AND CHECK THAT THROTTLE VALVE OPENS FULLY

   If the throttle valve does not open fully, adjust the accelerator link.
3. FULLY DEPRESS ACCELERATOR
4. LOOSEN ADJUSTMENT NUTS
5. ADJUST THROTTLE CABLE
   (a) Adjust the cable housing so that the distance between the end of the boot and the stopper on the cable is correct.

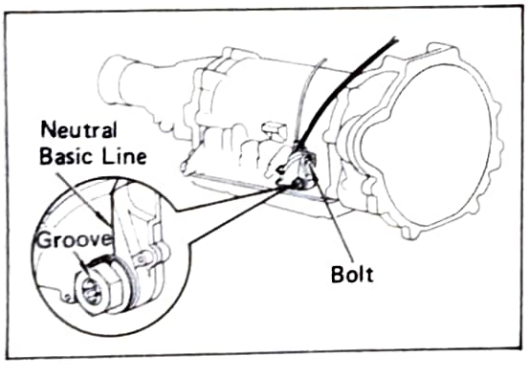
   Distance: 0 – 1 mm (0 – 0.04 in.)

   (b) Tighten the adjusting nuts.
   (c) Recheck the adjustments.
6. INSTALL AIR CLEANER



ADJUSTMENT OF FLOOR SHIFT LINKAGE

1. LOOSEN NUT ON CONNECTING ROD
2. ADJUST SHIFT LINKAGE
   (a) Push the manual lever fully toward the front of the vehicle.
   (b) Return the lever three notches to the NEUTRAL position.
   (c) Set the shift selector to "N".
   (d) While holding the selector lightly toward the "R" range side, tighten the connecting rod nut.



ADJUSTMENT OF NEUTRAL START SWITCH

If the engine will start with the shift selector in any range other than "N" or "P" range, adjustment is required.

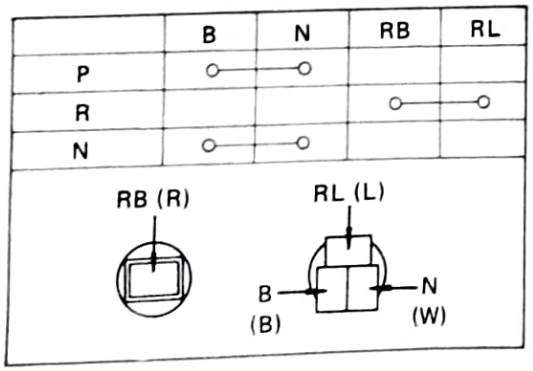
1. LOOSEN NEUTRAL START SWITCH BOLT
2. SET SHIFT SELECTOR TO "N"
3. ALIGN SWITCH SHAFT GROOVE WITH NEUTRAL BASIC LINE

   Align the groove and line as shown. Hold in position and tighten the bolt.

   Torque: 0.4 – 0.7 kg-m (35 – 60 in.-lb)
4. CHECK SWITCH TERMINALS FOR CONTINUITY

   Using an ohmmeter, check for continuity between the terminals as shown.

   If a problem is found, replace the switch.



TEST

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the maximum engine speeds at the "D" and "R" ranges.

MEASURE STALL SPEED

(a) Chock the front wheels.

(b) Mount the engine tachometer.

(c) Fully apply the parking brake.

(d) Step down strongly on the brake pedal with your left foot.

(e) Start the engine.

(f) Shift into "D" range. Step all the way down on the accelerator pedal with your right foot. Quickly read the highest engine rpm at this time.

Stall speed: 1,850 ± 150 rpm

(g) Perform the same test on the "R" range.

CAUTION:

(a) **Perform the test at normal operation fluid temperature (50 – 80°C or 122 – 176°F).**

(b) **Do not continuously run this test longer than 5 seconds.**

EVALUATION

(a) If the engine speed is the same for both ranges but lower than specified value.

- Engine output is insufficient.
- Stator one-way clutch is not operating properly.

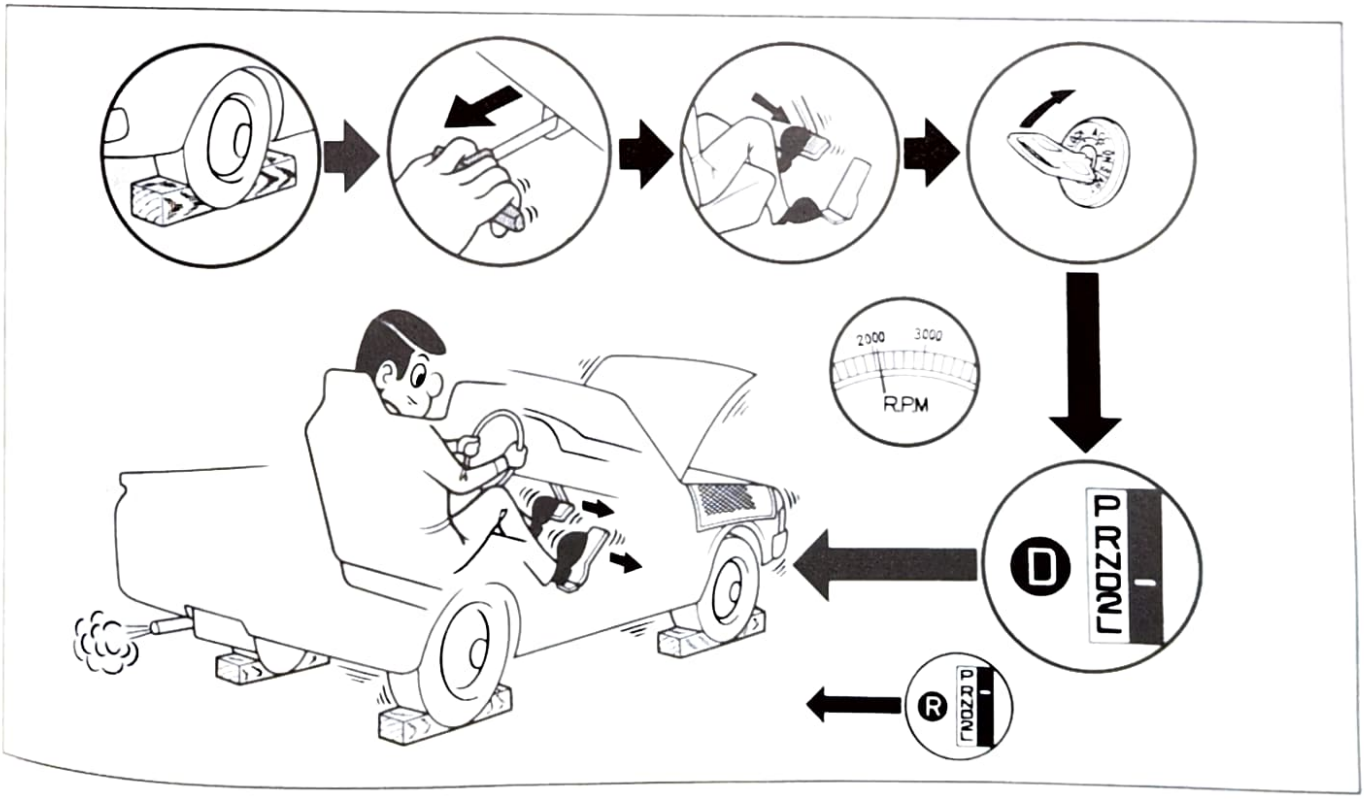
NOTE: If more than 600 rpm below the specified value, the torque converter could be at fault.

(b) If the stall speed at "L" range is higher than specified.

- Front clutch slipping.
- One-way clutch No. 2 not operating properly.
- Line pressure too low.
- OD clutch slipping
- OD one-way clutch not operating properly

(c) If the stall speed at "R" range is higher than specified.

- Rear clutch slipping.
- Brake No. 3 slipping.
- Line pressure too low.
- OD clutch slipping
- OD one-way clutch not operating properly



TIME LAG TEST

If the shift lever is shifted while the engine is idling, there will be a certain time elapse or time lag, before the shock can be felt. This is used for checking the condition of front clutch, rear clutch and brake No. 3.

MEASURE LAG TIME

(a) Have the parking brake fully applied.

(b) Start the engine.

(c) Place the hand on the shift lever and shift from "N" to "D" range.
Using a stopwatch, measure the time it takes from shifting the lever until the shock is felt.

Lag time: Less than 1.2 seconds

(d) In same manner, measure the time lag for "N" → "R".

Lag time: Less than 1.5 seconds

CAUTION:

(a) Perform the test at normal operation fluid temperature (50 – 80°C or 122 – 176°F).

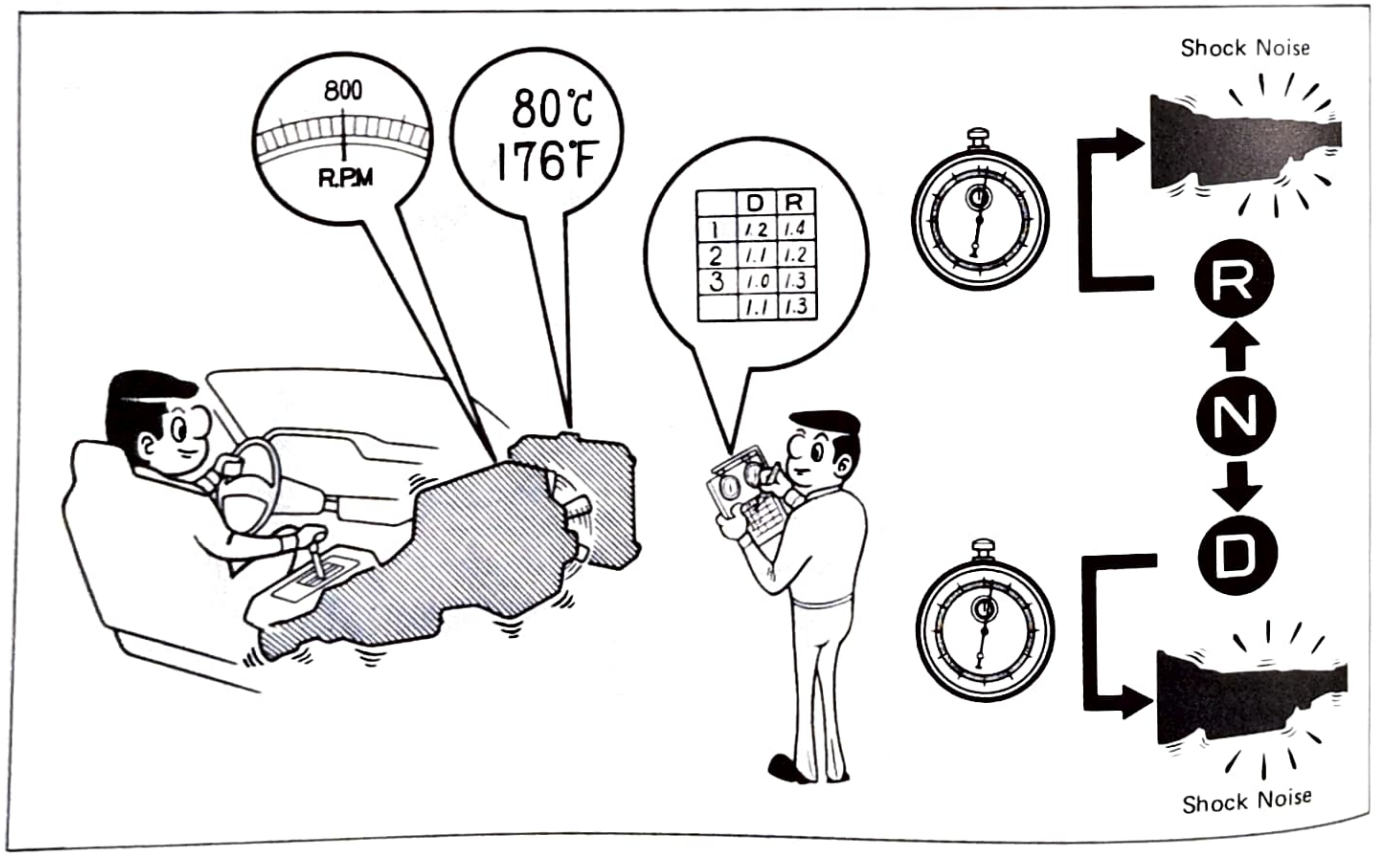
(b) Be sure to allow one minute interval between tests.

(c) Make three measurements and take the average value.

EVALUATION

(a) If "N" → "D" time lag is longer than specified.
- Line pressure too low.
- Front clutch worn.

(b) If "N" → "R" time lag is longer than specified.
- Rear clutch worn.
- Brake No. 3 worn.
- Line pressure too low.



HYDRAULIC TEST

1. PREPARATION

(a) Warm-up the transmission fluid.

(b) Chock the front wheels.

(c) Jack up the vehicle and support it on stands.

(d) Remove the test plugs from the transmission case and mount the hydraulic pressure gauges*.

***SST: 09992-00092 Oil pressure gauge**

2. MEASURE GOVERNOR PRESSURE

(a) Check the parking brake to see that it is not acting.

(b) Start the engine.

(c) Shift into "D" range and measure the governor pressures at the speeds specified in table.

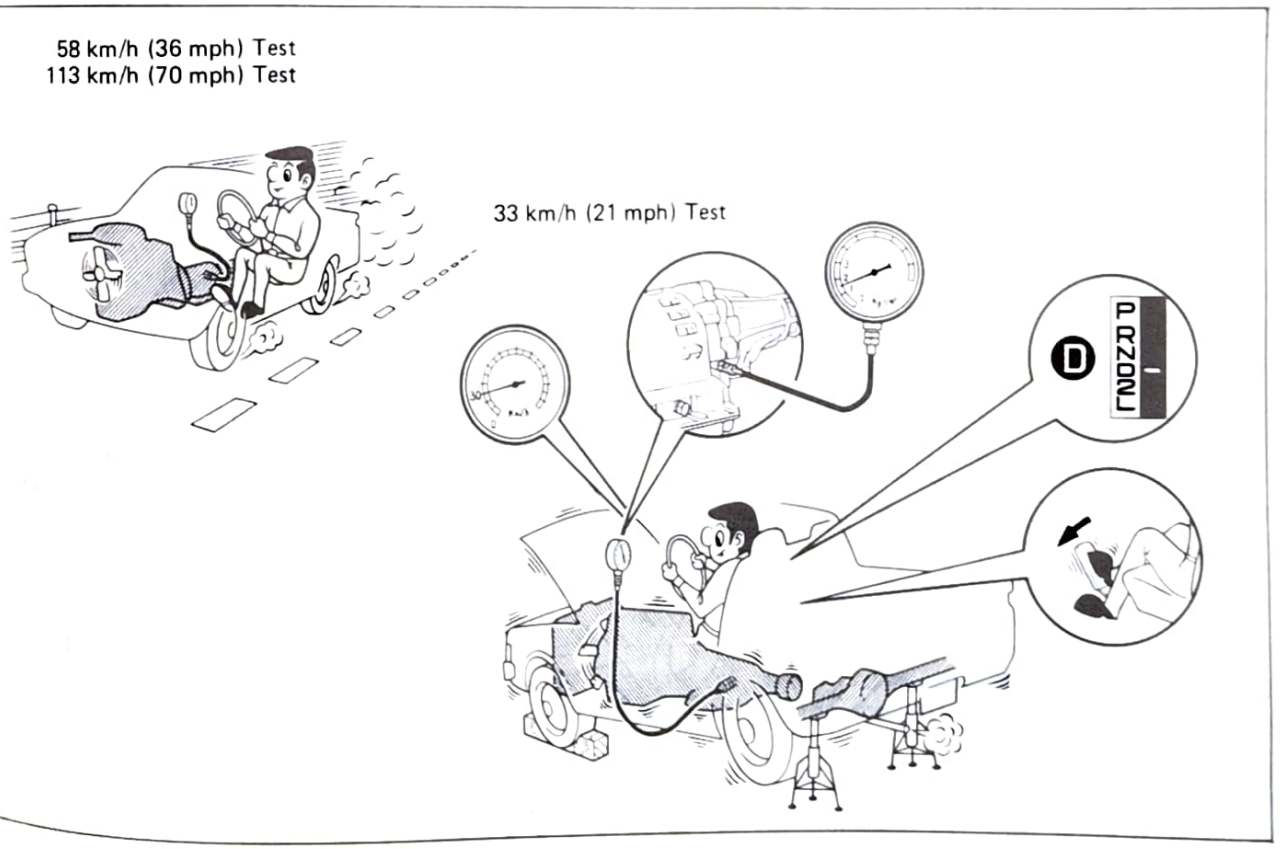
CAUTION: Decision can be reached with 1,000 rpm test (33 km/h test), but if tests are to be made at 1,800 and 3,500 rpm (58 and 113 km/h), it would be safer to test on road or chassis dynamometer as on-stand test could be hazardous.

EVALUATION

If governor pressure is defective.

- Line pressure defective.
- Fluid leakage in governor pressure circuit.
- Governor valve operation defective.

Output shaft rpm	Vehicle speed (Reference only)	Governor pressure kg/cm² (psi)
1,000	33 km/h (21 mph)	0.9 – 1.5 (13 – 21)
1,800	58 km/h (36 mph)	1.6 – 2.2 (23 – 31)
3,500	113 km/h (70 mph)	4.1 – 5.3 (58 – 75)



3. MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock four wheels.

(b) Start the engine and shift into "D" range.

(c) Step down strongly on the brake pedal with your left foot and while manipulating the accelerator pedal with the right foot, measure the line pressures at the engine speeds specified in table.

(d) In the same manner, perform the test for "R" range.

Engine speed rpm	Line pressure kg/cm² (psi)	
	"D" range	"R" range
1,000	4.0 – 4.5 (57 – 64)	5.8 – 6.8 (82 – 97)
Stall	9.5 – 12.0 (135 – 171)	14.0 – 17.0 (199 – 242)

(e) If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

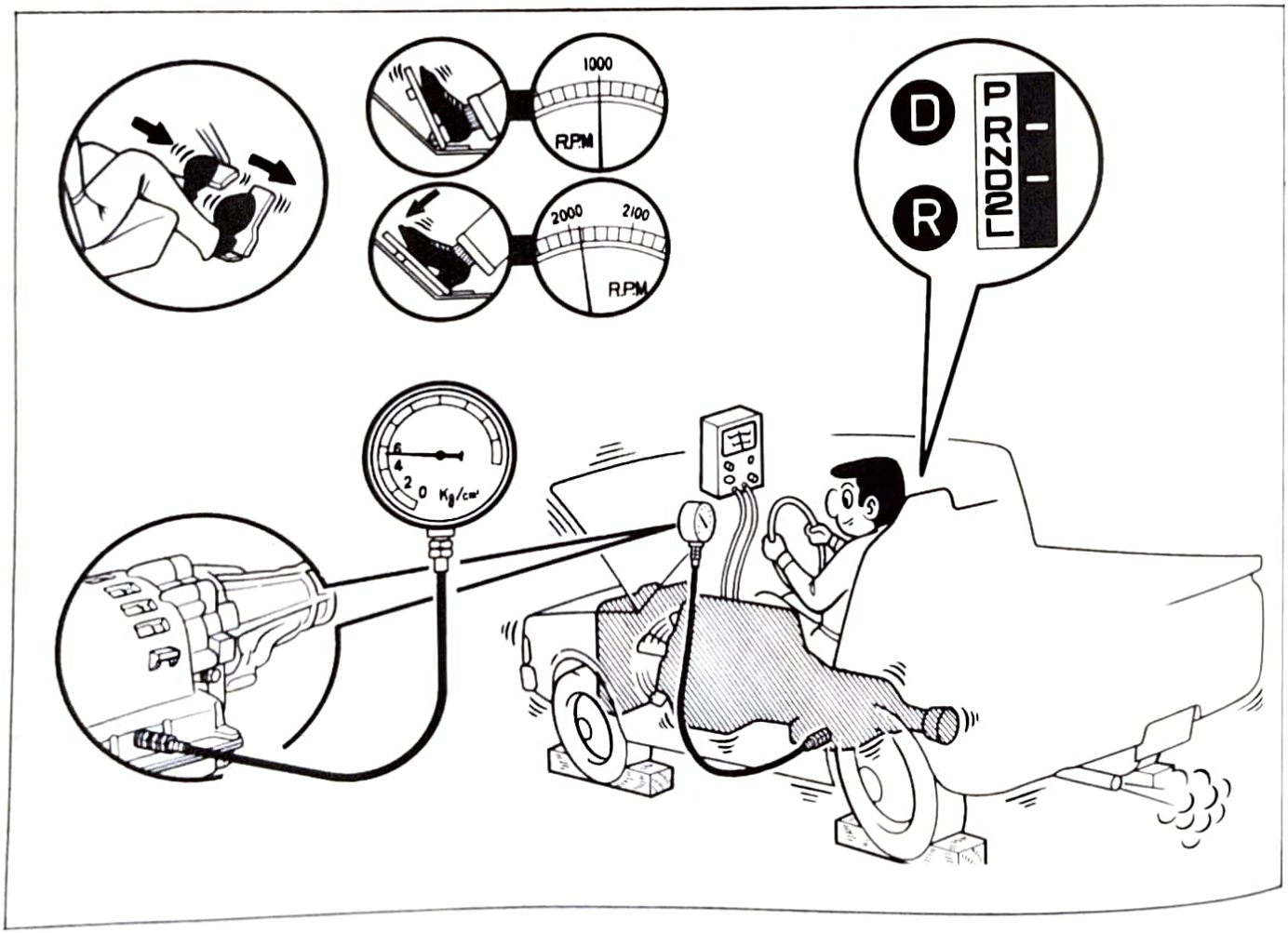
EVALUATION

(1) If the measured values at all ranges are higher than specified.
- Regulator valve defective
- Throttle valve defective
- Throttle cable out-of-adjustment

(2) If the measured values at all ranges are lower than specified.
- Oil pump defective
- Regulator valve defective
- Throttle valve defective
- Throttle cable out-of-adjustment
- OD clutch defective

(3) If pressure is low in "D" range only.
- Front clutch defective.
- "D" range circuit fluid leakage
- OD clutch defective

(4) If pressure is low in "R" range only.
- Rear clutch defective.
- Brake No. 3 defective.
- "R" range circuit fluid leakage
- OD clutch defective

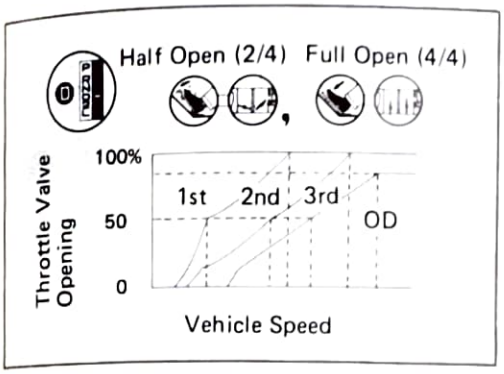


ROAD TEST

1. "D" RANGE TEST

Shift into "D" range and while driving with the accelerator pedal held constant at specified point (throttle valve opening 1/2 and 4/4), and check on the following points.

(a) At each of the above throttle openings, check to see that 1 → 2, 2 → 3 and 3 → OD up-shifts take place and also that the shift points conform to those shown on the automatic shift diagram.



EVALUATION

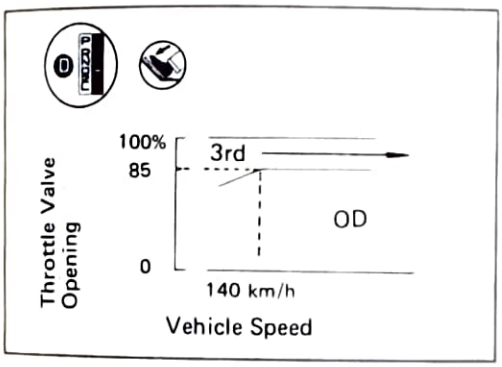
(1) If there is no 1 → 2 up-shift,
- Governor valve is defective
- 1-2 shift valve is stuck

(2) If there is no 2 → 3 up-shift,
- 2-3 shift valve is stuck

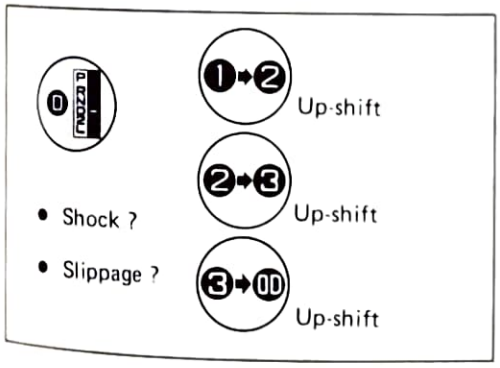
(3) If there is no 3 → OD up-shift throttle valve opening 1/2),
- 3-OD shift valve is stuck

(4) If the shift point is defective,
- Throttle cable is out-of-adjustment
- Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-OD shift valve etc., are defective.

NOTE: 3 → OD up-shift does not take place with a throttle valve opening of more than 85%.



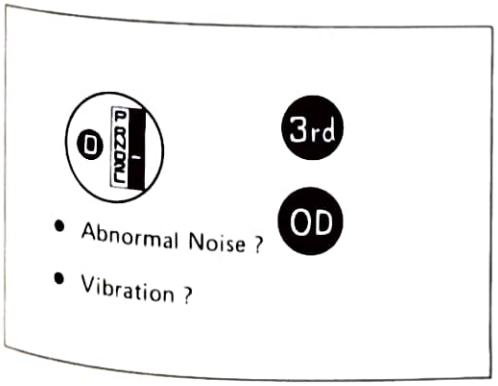
(b) In the same manner, check the shock and the slip at 1 → 2, 2 → 3 and 3 → OD up-shifts.



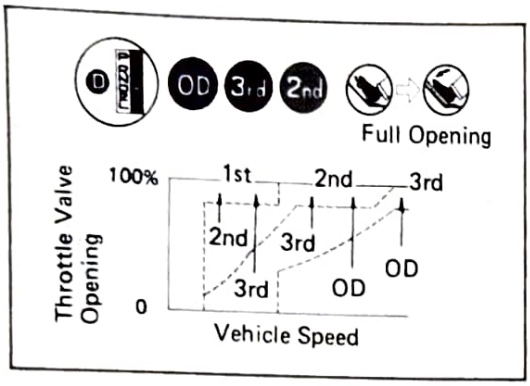
EVALUATION

If the shock is large,
- Line pressure is too high
- Accumulator is defective
- Check ball is defective

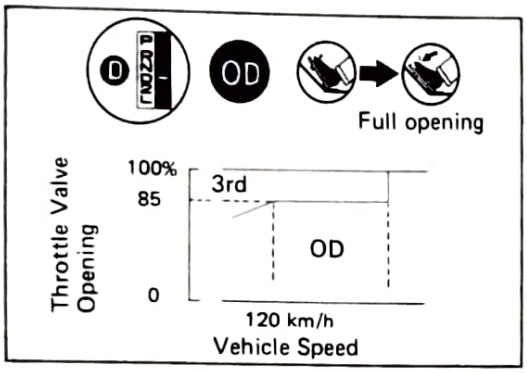
(c) Run at "D" range third gear or OD gear and check for abnormal noise and vibration.



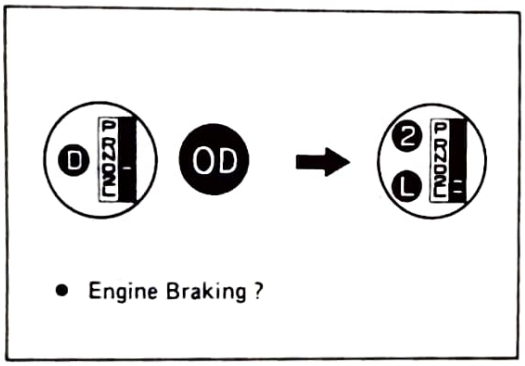
NOTE: Check for cause of abnormal noise and vibration must be made with extreme care as they could also be due to unbalance in propeller shaft, differential, tire, torque converter, etc. or bending rigidity, etc., in the power train.



(d) While running in "D" range second, third and OD gears, check to see that the possible kick-down vehicle speed limits for 2 → 1, 3 → 2, OD → 3 and OD → 2 kick-downs conform to those indicated on the automatic shift diagram.



NOTE: OD → 3 kick-down is always possible with a throttle valve opening of less than 85% and vehicle speed above 120 km/h.

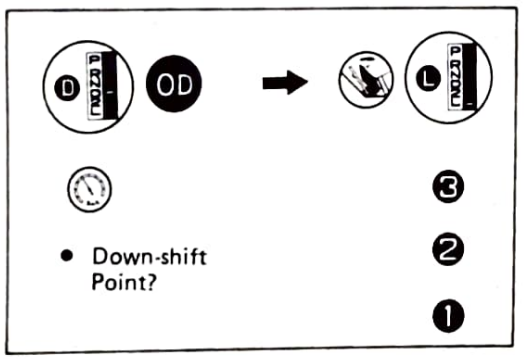


(e) While running in "D" range third gear or OD gear, shift to "2" and "L" ranges and check the engine braking effect at each of these ranges.

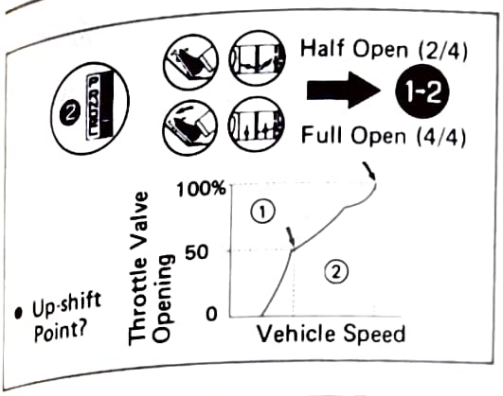
EVALUATION

(1) If there is no engine braking effect at "2" range
- Brake No. 1 is defective

(2) If there is no engine braking effect at "L" range
- Brake No.3 is defective

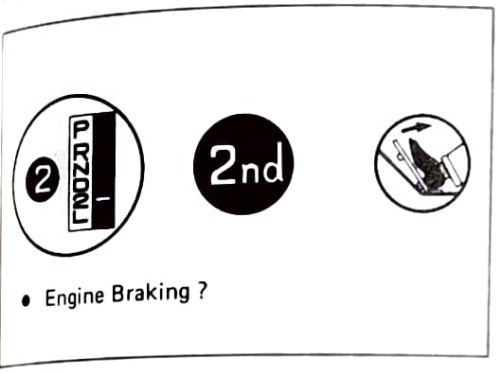


(f) While running in "D" range, release the foot from the accelerator pedal and shift into "L" range. Then check to see if OD → 3, 3 → 2 and 2 → 1 down-shift points conform to those indicated on the automatic shift diagram.

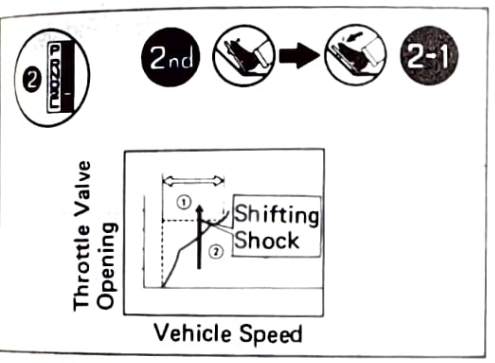


2. "2" RANGE TEST

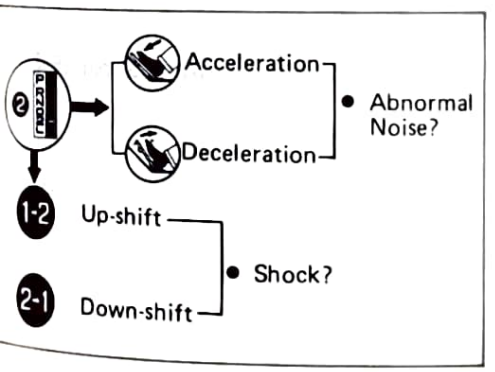
(a) Shift to the "2" range and run with the throttle valve opening at 2/4 and 4/4 respectively. Then check the 1 → 2 up-shift points at each of the throttle valve openings to see that it conforms to those indicated on the automatic shift diagram.



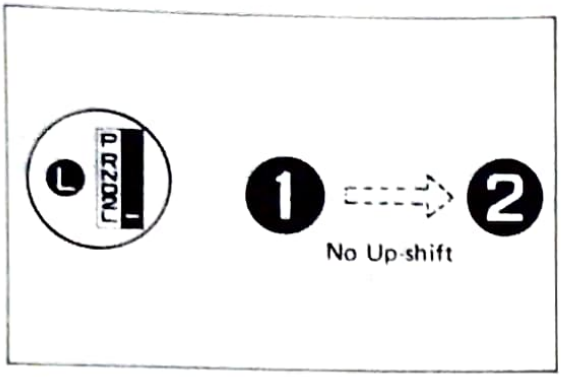
(b) While running in "2" range second gear, release the accelerator pedal and check the engine braking effect.



(c) Perform a kick-down from the "2" range and check the possible 2 → 1 kick-down vehicle speed limit to see if it conforms to that indicated on the automatic shift diagram.

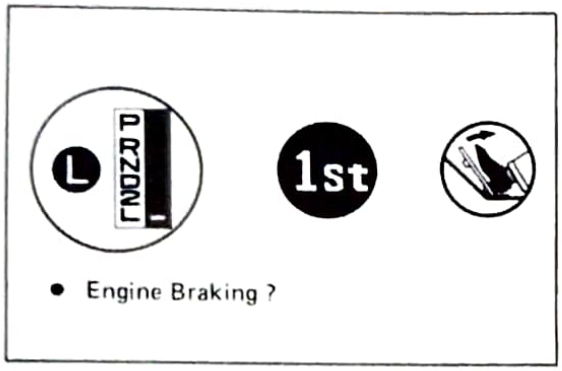


(d) Check for abnormal noise at acceleration and deceleration, and for shock at up-shift and down-shift.

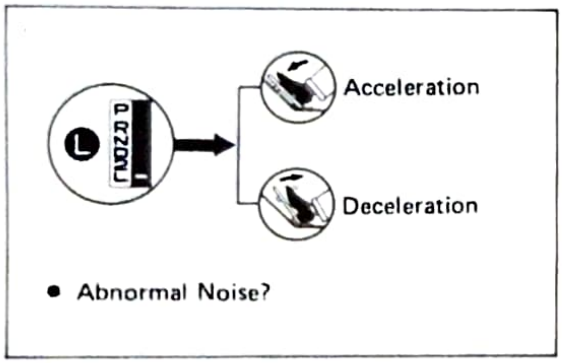


3. "L" RANGE TEST

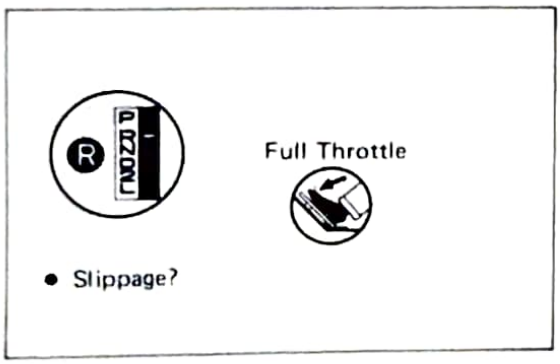
(a) While running in the "L" range, check to see that there is no up-shift to second gear.



(b) While running in "L" range, release the accelerator pedal and check the engine braking effect.



(c) Check for abnormal noise at acceleration and deceleration.



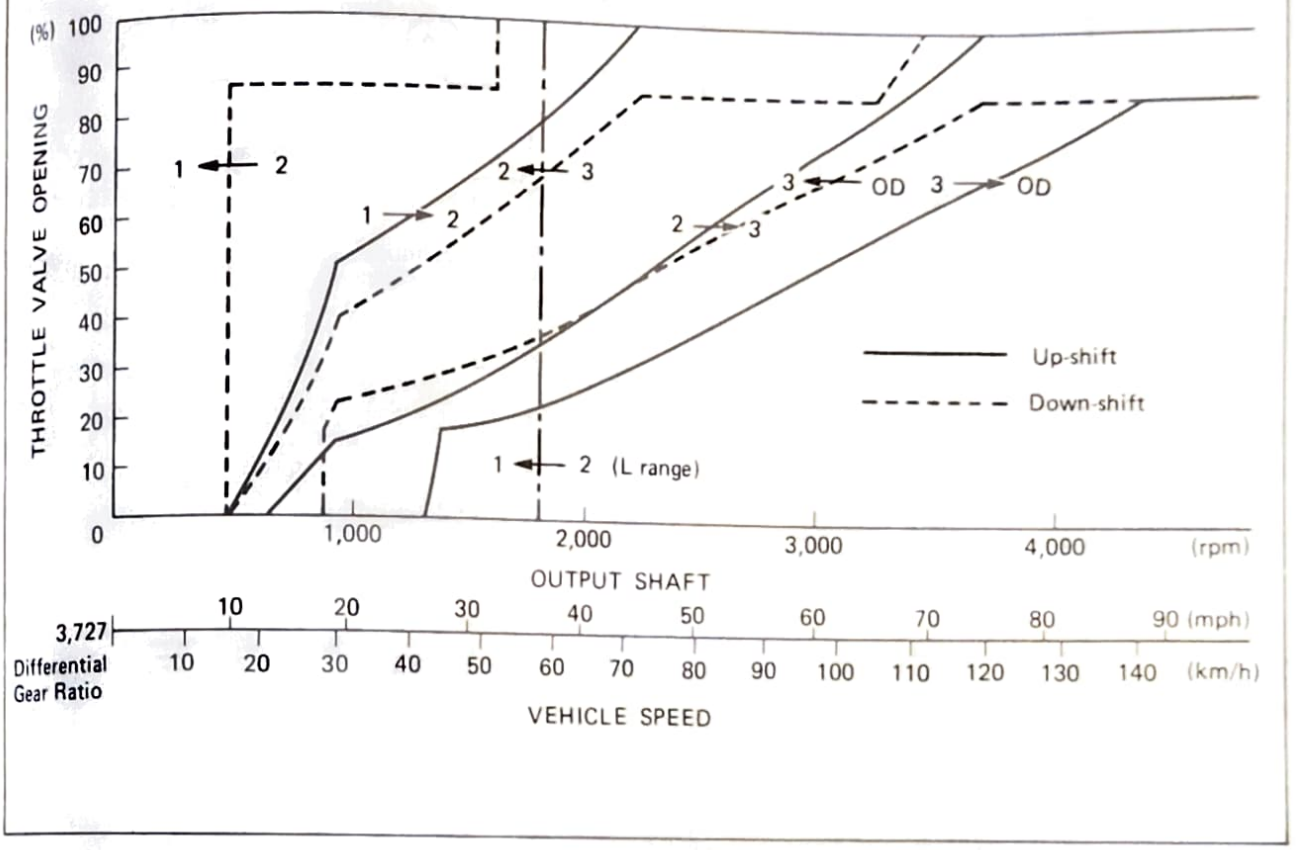
4. "R" RANGE TEST

(a) Shift into "R" range and while running at full throttle, check for slipping.

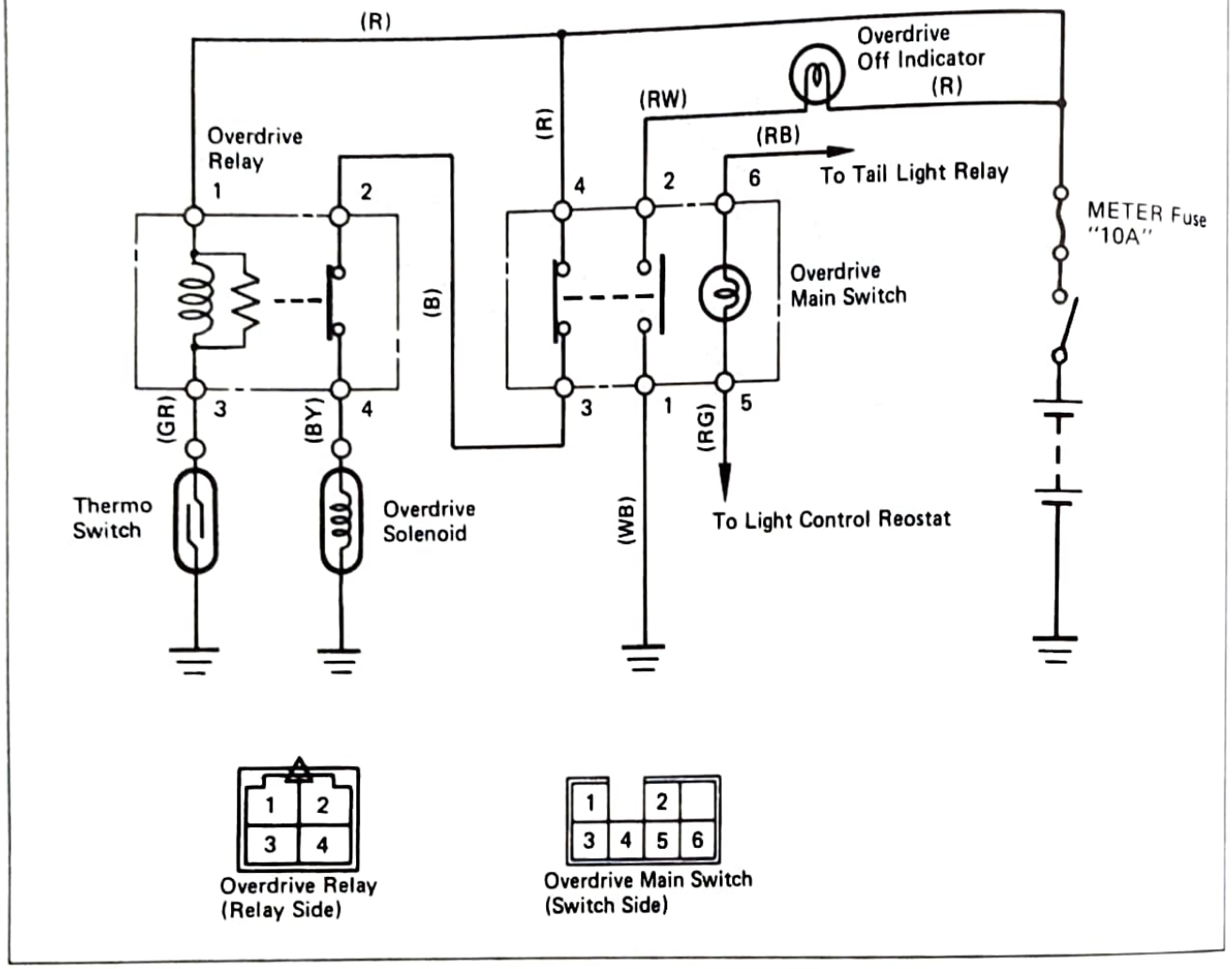
5. "P" RANGE TEST

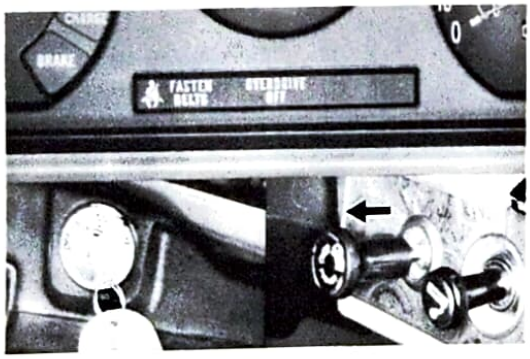
Stop the vehicle on a gradient (more than 5°) and after shifting into "P" range, release the parking brake. Then check to see that the parking lock pawl is acting so that vehicle will not move.

AUTOMATIC SHIFT DIAGRAM



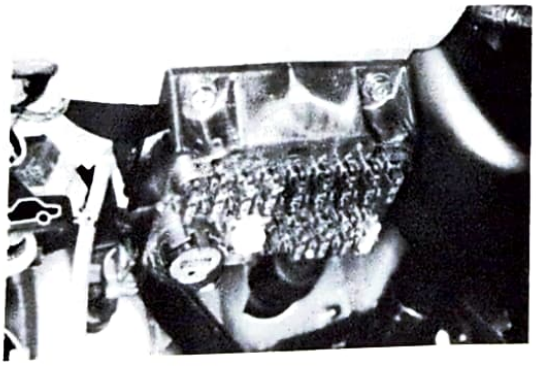
ELECTRIC CONTROL



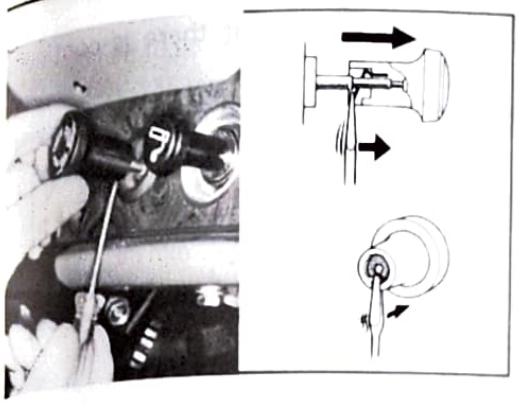


1. **INSPECT OVERDRIVE OFF INDICATOR LIGHT**
   (a) Turn on the ignition switch.
   (b) Pull the overdrive knob to the off position and confirm that the off indicator light is lit.

   If the light is not lit, check the ignition switch, fuse and main switch.

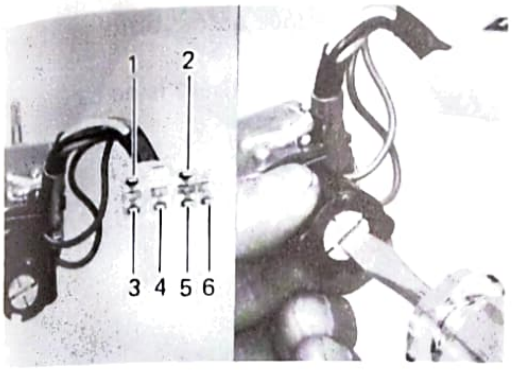


2. **INSPECT FUSE**
   (a) Check the fuse for continuity.
   (b) Check that the fuse is connected correctly.



3. INSPECT OVERDRIVE MAIN SWITCH

(a) Disconnect the overdrive main switch wire and remove the switch from the instrument panel.



(b) Using an ohmmeter, check the continuity of the terminals for each switch positions.

Switch position \ Terminal	1	2	3	4	5	6
ON (Push)			○—○		○ (A) ○	
OFF (Pull)	○—○				○	○

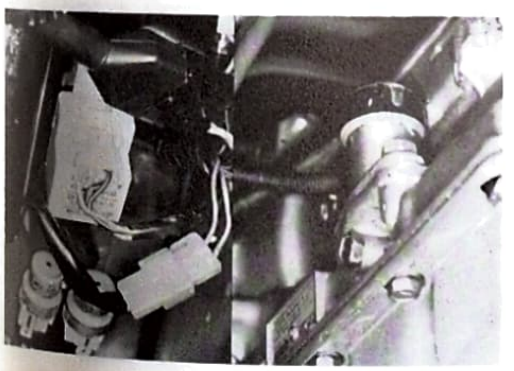
(c) Using a screwdriver, remove the valve holder and check the valve.

4. INSPECT OVERDRIVE RELAY [ON-VEHICLE INSPECTION]

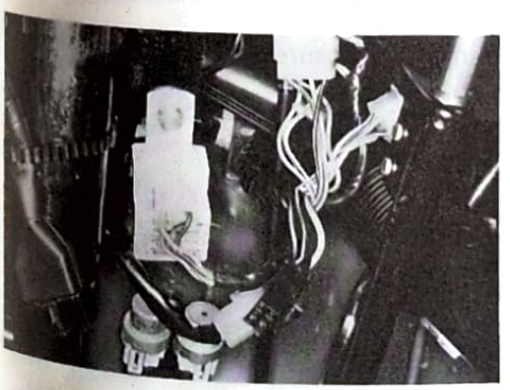
(a) Directly ground the thermo switch wire.

(b) Turn on the ignition switch.

(c) Repeatedly turn the main switch ON and OFF and confirm that operation sounds of the solenoid and relay can be heard.

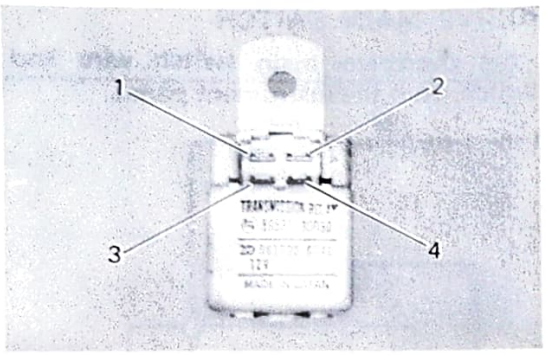


If neither the solenoid or relay does not make a noise, check.



[COMPONENT INSPECTION]

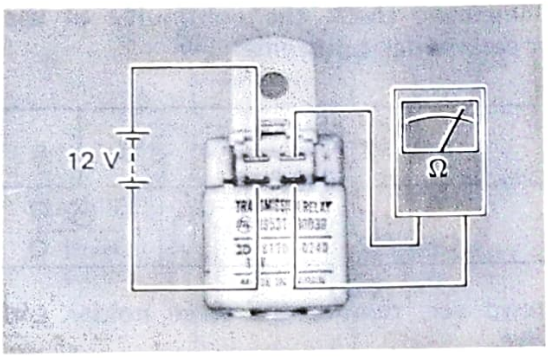
(a) Remove the overdrive relay from the pedal bracket.



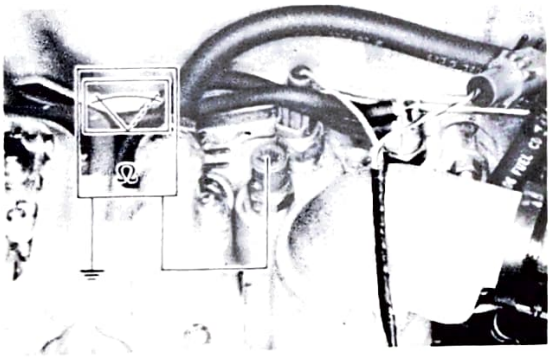
(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

(c) Using an ohmmeter, measure the resistance between terminals 1 and 3.

Resistance: 8 ohms



(d) Apply 12 volts battery voltage across terminals 1 and 3.
Using an ohmmeter, check that there is no continuity between terminals 2 and 4.

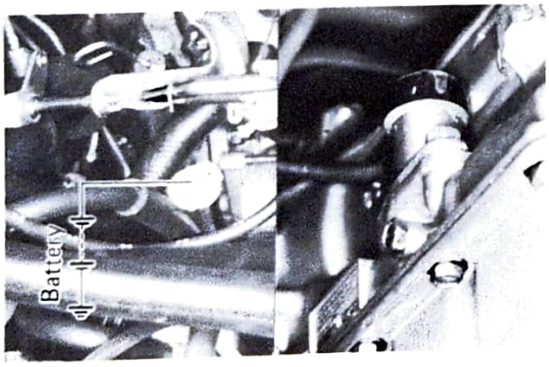


5. INSPECT THERMO SWITCH

(a) Disconnect the thermo switch wire.

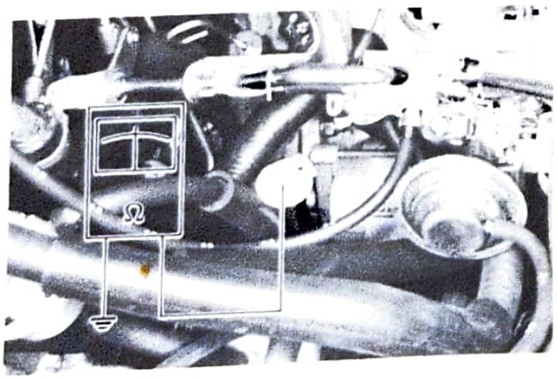
(b) Using an ohmmeter, measure the resistance between the terminal and ground

Coolant temperature	Resistance (Point)
Below 43°C (109°F)	0 ohms (Close)
Above 55°C (131°F)	∞ ohms (Open)



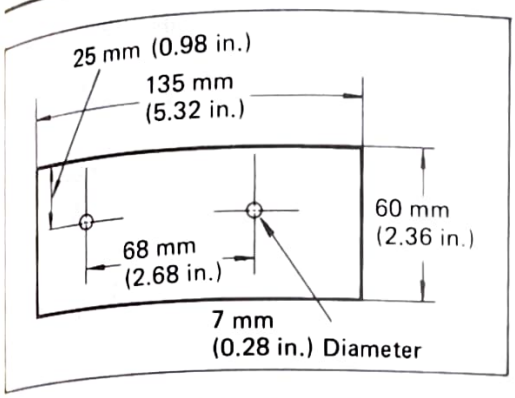
6. INSPECT OVERDRIVE SOLENOID

(a) Disconnect the solenoid wire and apply 12 volts battery voltage to the solenoid.
Confirm that the solenoid operation sound is heard.



(b) Using an ohmmeter, measure the solenoid coil resistance.

Resistance: 13 ohms

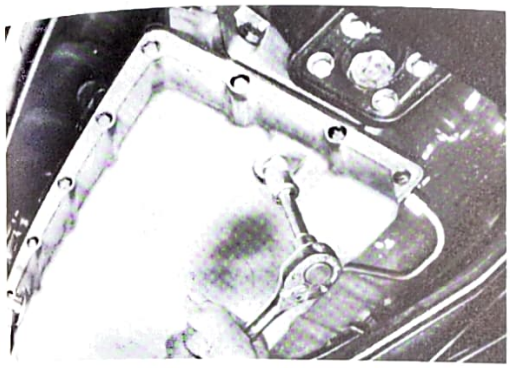


ON-VEHICLE REPAIR

REMOVAL OF VALVE BODY

1. MAKE PLATE TO RETAIN ACCUMULATOR PISTONS

A retainer is helpful for holding accumulator pistons in the case during removal and installation of the valve body. The plate may be made from aluminum or plastic.

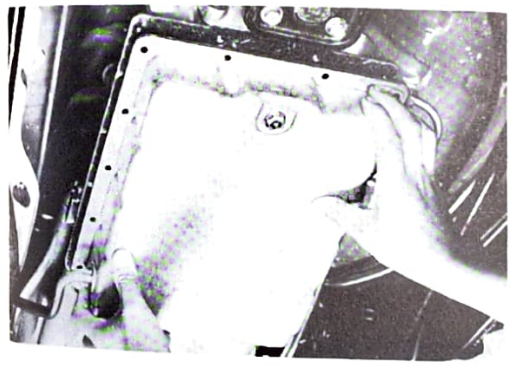


2. CLEAN TRANSMISSION EXTERIOR

To help prevent contamination, clean the exterior of the transmission.

3. DRAIN TRANSMISSION FLUID

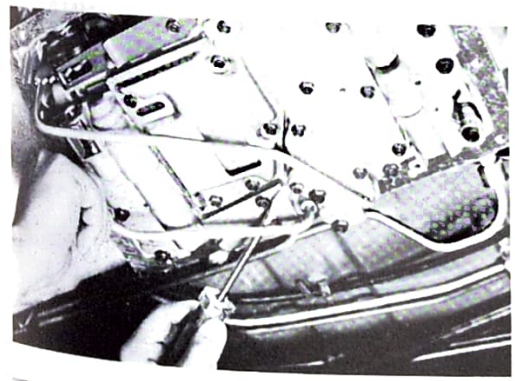
Remove the drain plug and drain fluid into a suitable container.



4. REMOVE OIL PAN, FILLER TUBE AND GASKET

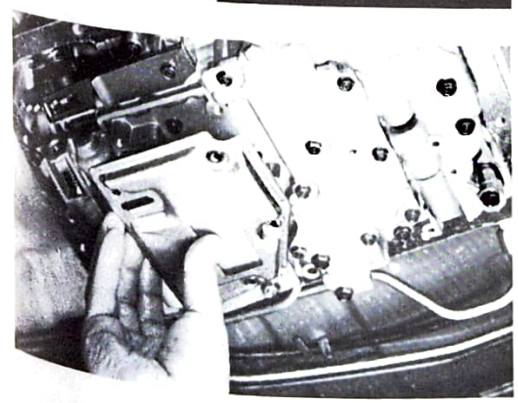
CAUTION: Some fluid will still be in the oil pan. Be careful not to damage the filler tube and O-ring.

Remove all pan bolts, and carefully remove the pan assembly. Discard the gasket.



5. REMOVE OIL TUBES

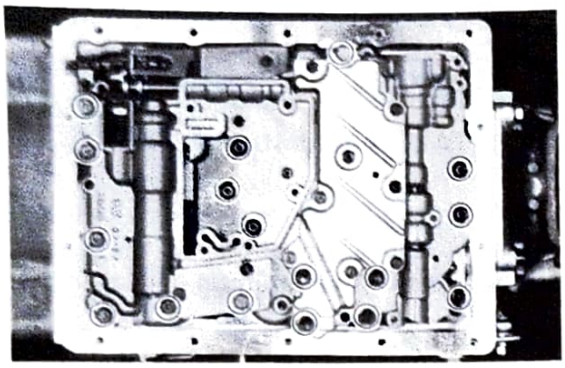
Using a screwdriver, pry up both tube ends and remove the tubes.



6. REMOVE OIL STRAINER

Remove five bolts, and the oil strainer.

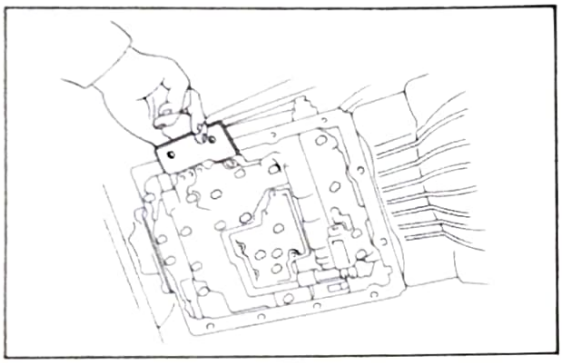
CAUTION: Be careful as some oil will come out with the filter.



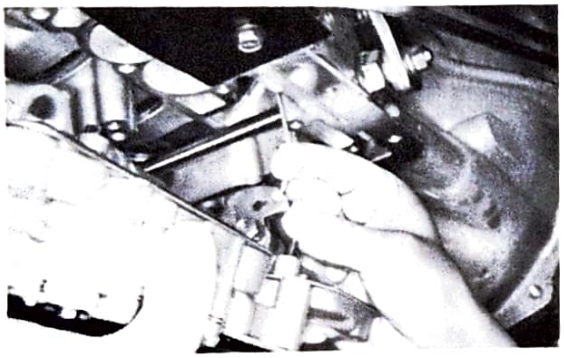
7. REMOVE VALVE BODY

(a) Remove seventeen bolts.

NOTE: Bolt lengths will be shown for installation, so there is no need to mark them now.



(b) Lower valve body slightly, and install the accumulator piston retaining plate. Hold in place with two pan bolts, finger tight.



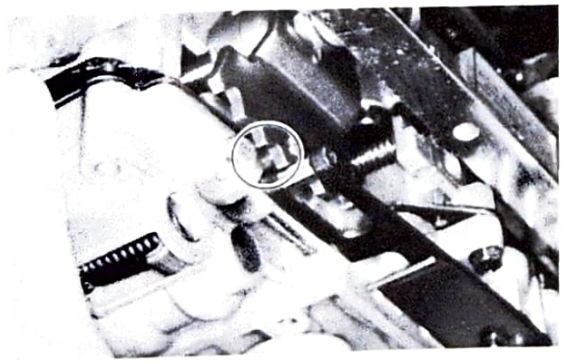
(c) Disconnect the throttle cable from the cam and remove the valve body.

DISASSEMBLY, INSPECTION AND ASSEMBLY OF VALVE BODY (See page 10-86)

INSTALLATION OF VALVE BODY

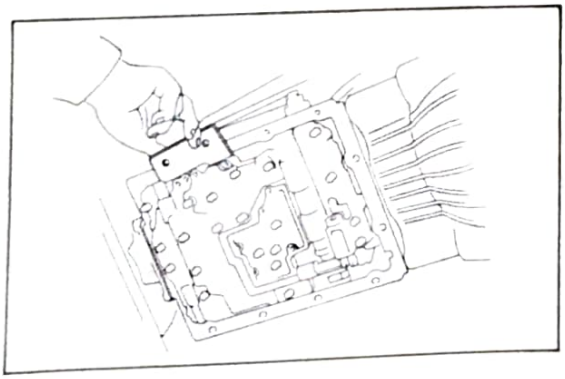
1. CONNECT THROTTLE CABLE TO CAM

Push the cable fitting into the cam.



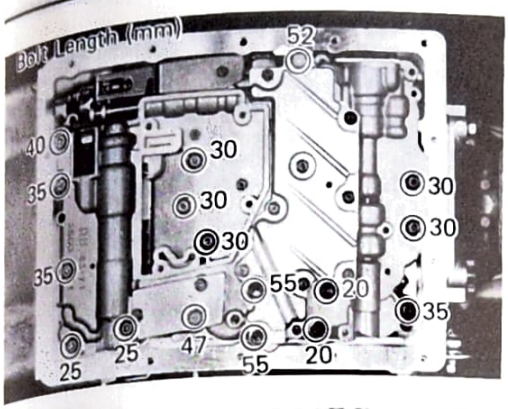
2. ALIGN MANUAL VALVE LEVER WITH MANUAL VALVE, AND LOOSELY INSTALL SEVERAL BOLTS IN VALVE BODY

Leave the bolts loose so that the accumulator retaining plate can be removed.



3. REMOVE ACCUMULATOR RETAINING PLATE

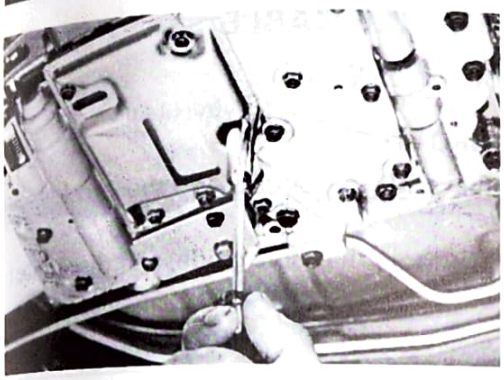
Remove two pan bolts, and slide out the plate.



4. **INSTALL VALVE BODY BOLTS**

Install the bolts as shown. Tighten the bolts evenly.

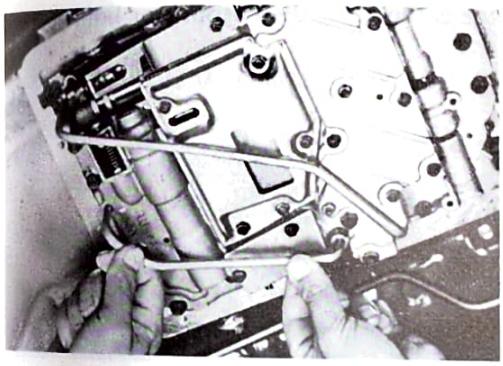
Torque: 0.8 – 1.2 kg-m (70 – 104 in.-lb)



5. **INSTALL OIL SCREEN**

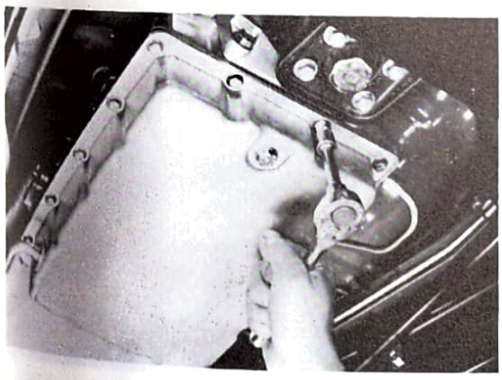
Be sure the screen is clean. Torque the bolts.

Torque: 0.5 – 0.6 kg-m (44 – 52 in.-lb)



6. **INSTALL TWO OIL TUBES**

Press the tubes by hand into the positions indicated in the figure.



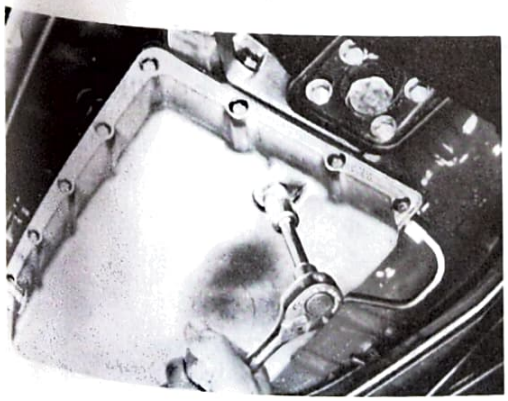
7. **INSTALL PAN WITH NEW GASKET**

Be sure the pan is clean and the magnet is in place.

CAUTION: Do not use gasket sealer.

Tighten bolts evenly.

Torque: 0.4 – 0.5 kg-m (35 – 43 in.-lb)



8. **INSTALL DRAIN PLUG**

Torque the drain plug.

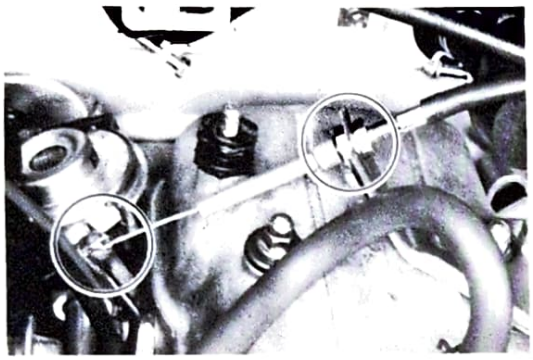
Torque: 1.8 – 2.3 kg-m (13 – 16 ft-lb)

9. FILL TRANSMISSION WITH ATF

Add only about four quarts of ATF. Start the engine and shift through all the gears. Check the fluid level and add as necessary.

CAUTION: Do not overfill.

REMOVAL OF THROTTLE CABLE

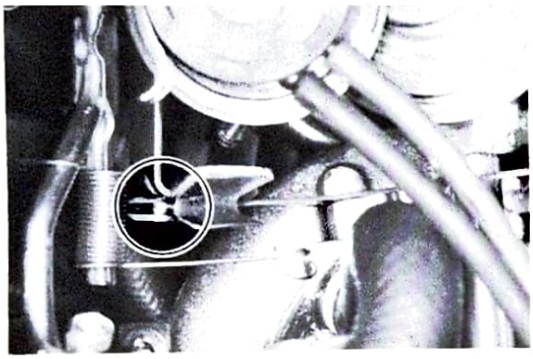


1. REMOVE AIR CLEANER

2. DISCONNECT THROTTLE CABLE

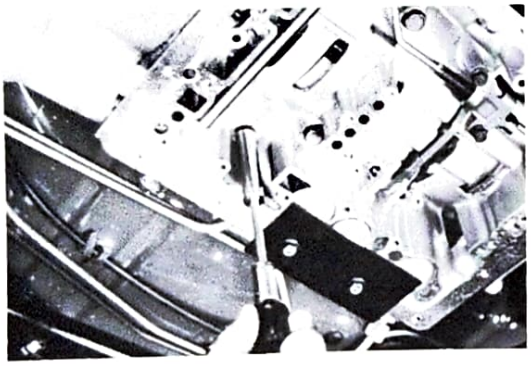
(a) Disconnect the cable housing from the bracket on the valve cover.

(b) Remove the clip from the cable guide, and disconnect the guide grommet.



(c) Disconnect the cable from the carburetor linkage.

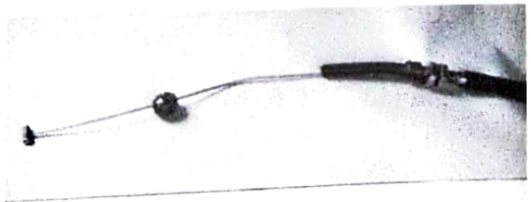
3. REMOVE VALVE BODY (See page 10-18)



4. PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE

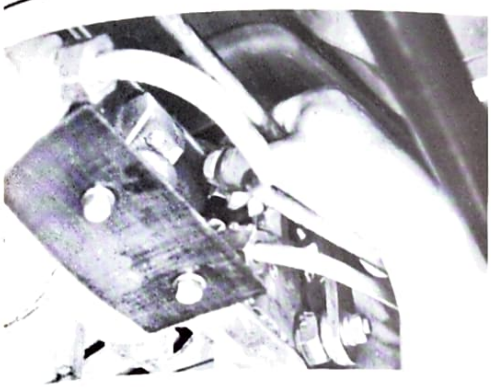
Using a 10 mm socket, push the throttle cable out.

INSPECTION OF THROTTLE CABLE



CHECK PARTS FOR WEAR, DAMAGE, CRACKS OR SMOOTH OPERATION

Replace parts as necessary.

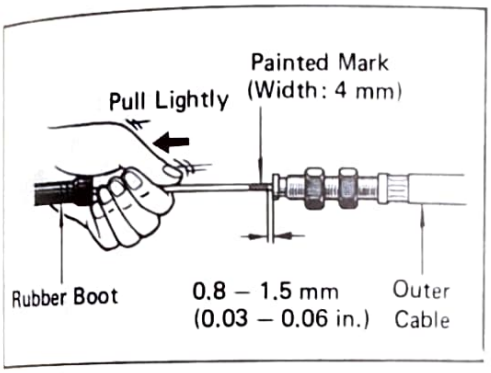


INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

   Be sure to push it in all the way.

2. INSTALL VALVE BODY (See page 10-19)

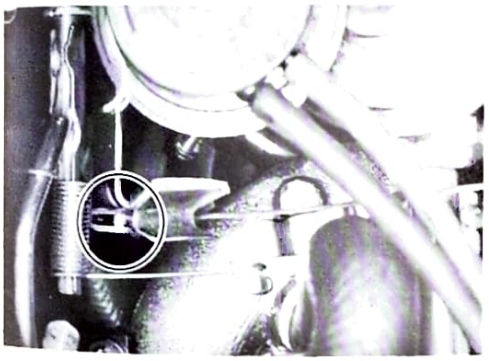


3. IF THROTTLE CABLE IS NEW, PAINT MARK ON INNER CABLE

   NOTE: New cables do not have a cable stopper installed. Therefore, to make adjustment possible, paint a mark as described below.

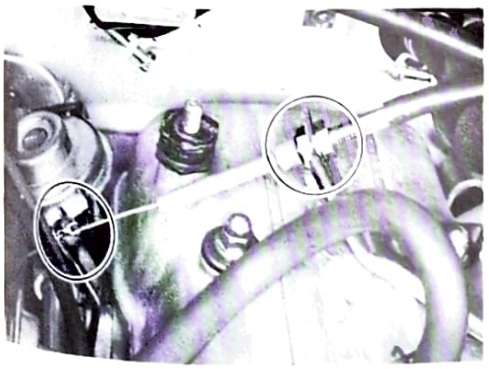
   (a) Pull the inner cable lightly until a slight resistance is felt, and hold it.

   (b) Paint a mark as shown, about 4 mm (0.16 in.) in width.



4. CONNECT THROTTLE CABLE

   (a) Connect the cable to the carburetor linkage.



   (b) Put the guide grommet into position, and install the clip.

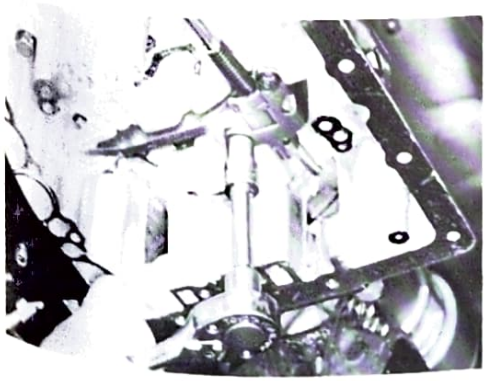
   (c) Connect the cable housing to the bracket on the valve cover.

5. ADJUST THROTTLE CABLE (See page 10-5)

6. INSTALL AIR CLEANER

7. TEST DRIVE VEHICLE

REMOVAL OF PARK PAWL

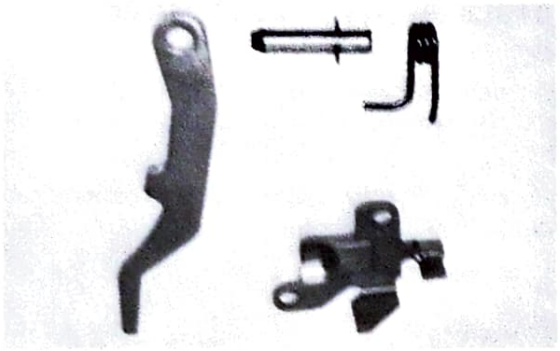


1. REMOVE VALVE BODY (See page 10-18)

2. REMOVE PARK LOCK PAWL BRACKET

   Remove two bolts and the bracket.

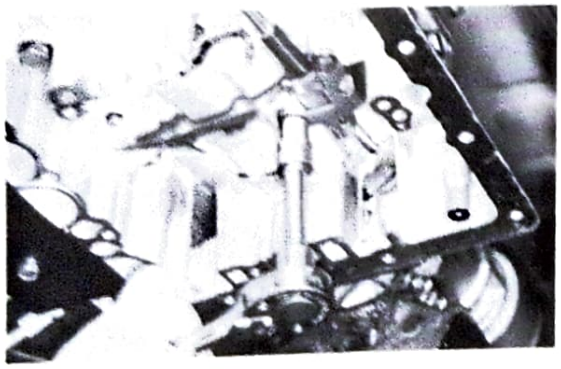
3. REMOVE SPRING, PARK PAWL PIVOT PIN AND PARK PAWL



4. CLEAN AND INSPECT PARK PAWL SUBASSEMBLY
   (a) Use only clean solvent, and dry parts with compressed air.
   (b) Check spring, pivot pin, pawl, bracket and rod for wear or damage. Replace parts as necessary.

INSTALLATION OF PARK PAWL

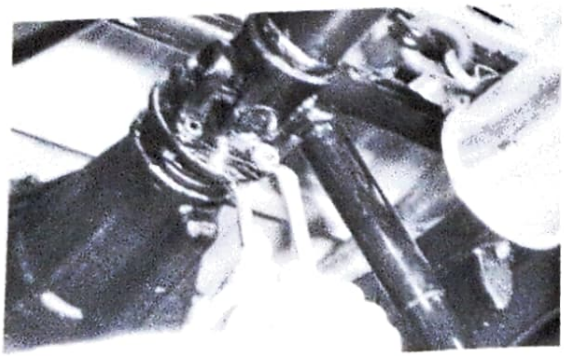
1. INSTALL PARK PAWL, PARK PAWL PIVOT PIN AND SPRING



2. INSTALL PARK LOCK PAWL BRACKET
   (a) Push lock rod fully forward.
   (b) Install two bolts finger tight.
   (c) Check that the pawl operates smoothly.
   (d) Torque the bolts.
   Torque: 0.6 — 0.9 kg-m (53 — 78 in.-lb)

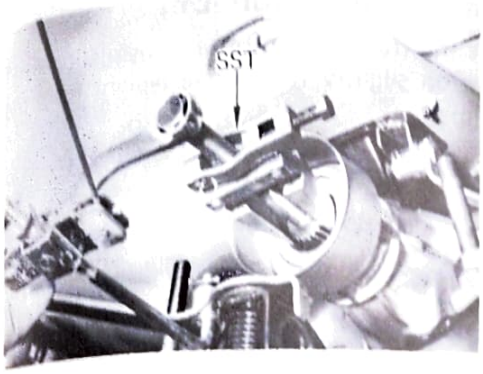
3. INSTALL VALVE BODY (See page 10-19)

REPLACEMENT OF REAR OIL SEAL



1. RAISE VEHICLE, AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP

2. REMOVE PROPELLER SHAFT (See page 12-3)

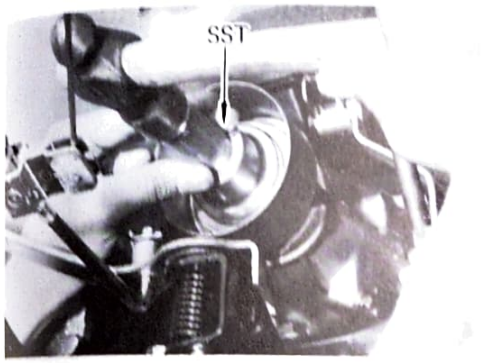


3. REMOVE REAR DUST SEAL AND OIL SEAL

CAUTION: Clean the rear extension housing before removing the seal.

Using a seal puller*, remove the two seals.

*SST 09308-10010 or Commercial puller



4. INSTALL NEW OIL SEAL AND DUST SEAL

Using a seal driver*, drive in the oil seal as far as it will go. Drive in the dust seal flush with the housing.

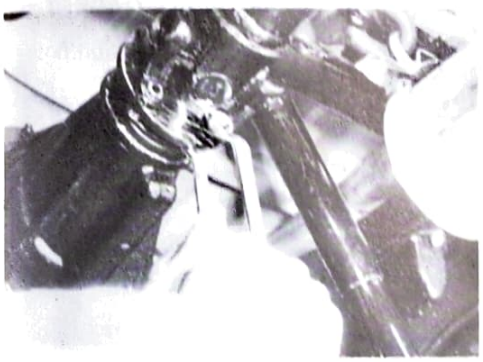
*SST 09325-20010 or Commercial driver

5. INSTALL PROPELLER SHAFT (See page 12-7)

6. LOWER VEHICLE AND CHECK FLUID LEVEL

Start the engine, shift the selector into each gear, then check the fluid level with the transmission in PARK. Add fluid as necessary.

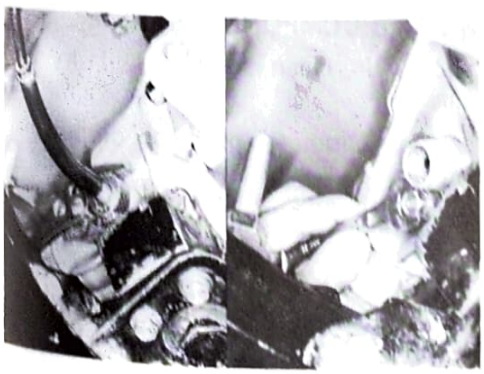
CAUTION: Do not overfill.



REMOVAL OF EXTENSION HOUSING

1. RAISE VEHICLE AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP

2. REMOVE PROPELLER SHAFT (See page 12-3)

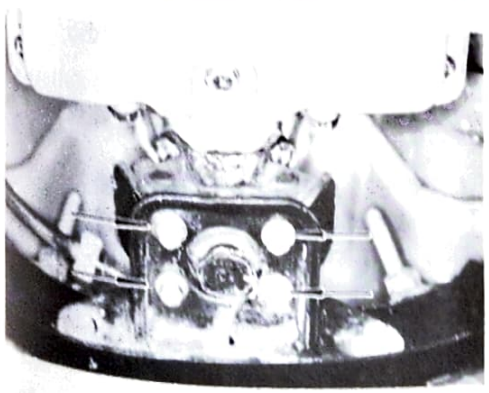


3. DISCONNECT SPEEDOMETER CABLE

Loosen serrated collar with water pump pliers. Do not lose the felt dust protector and washer.

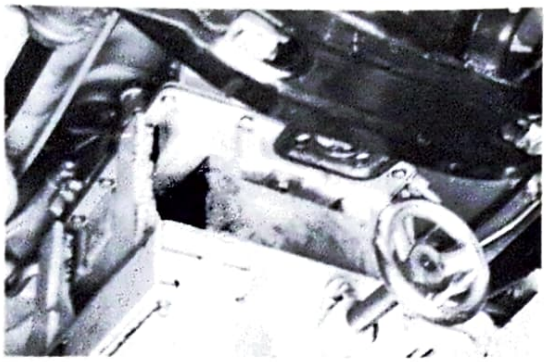
4. REMOVE SPEEDOMETER DRIVEN GEAR

Remove one bolt and locking tab. Pry out the speedometer gear with a screwdriver.



5. DISCONNECT ENGINE REAR MOUNTING FROM BRACKET

Remove four bolts from the bracket.

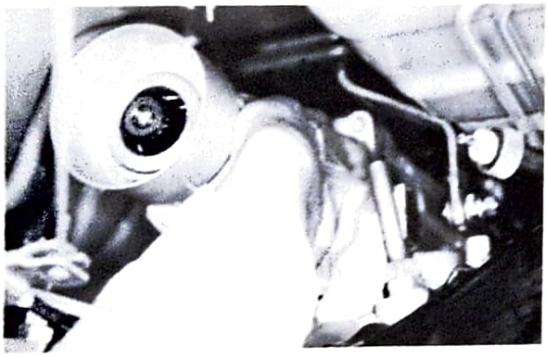


6. **JACK UP TRANSMISSION SLIGHTLY**

Securely support the transmission on a transmission jack. Lift the transmission slightly to remove weight from the rear support member.

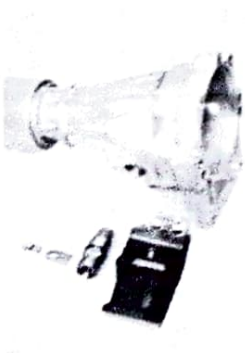
7. **REMOVE ENGINE REAR MOUNTING FROM EXTENTION HOUSING**

Remove four bolts and the engine rear mounting from the extension housing.



8. **REMOVE EXTENSION HOUSING AND GASKET**

Remove six bolts. If necessary, tap the extension housing with a plastic hammer to loosen it.



9. **CLEAN AND INSPECT COMPONENTS**

(a) Wash components in clean solvent, and dry with compressed air.

(b) Check the case, speedometer gear and output shaft for cracks, wear and damage.

INSTALLATION OF EXTENSION HOUSING

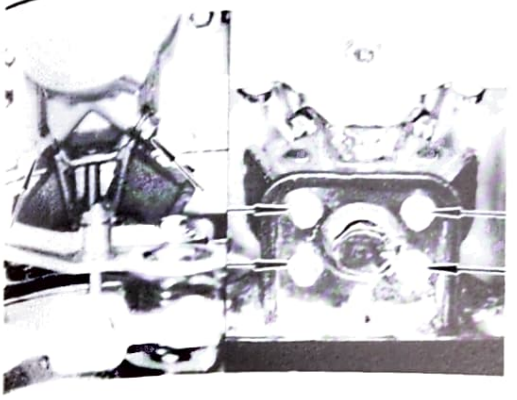
NOTE: If necessary, install a new oil seal before installation. (See page 10-107)

1. **INSTALL NEW GASKET AND EXTENSION HOUSING ON TRANSMISSION**

Install six bolts finger tight, then torque the bolts.

Torque: 2.7 – 4.2 kg-m (20 – 30 ft-lb)

NOTE: The two lower bolts are shorter.



2. INSTALL ENGINE REAR MOUNTING

(a) Install the engine rear mounting to the extension housing. Tighten the four bolts.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)

(b) Lower and rest the transmission on the mounting bracket.

(c) Connect the mounting to the bracket. Tighten the four bolts.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

3. INSTALL SPEEDOMETER DRIVEN GEAR

(a) Install a new O-ring on the shaft sleeve.

(b) Install the lock plate with a bolt and washer.

4. CONNECT SPEEDOMETER CABLE

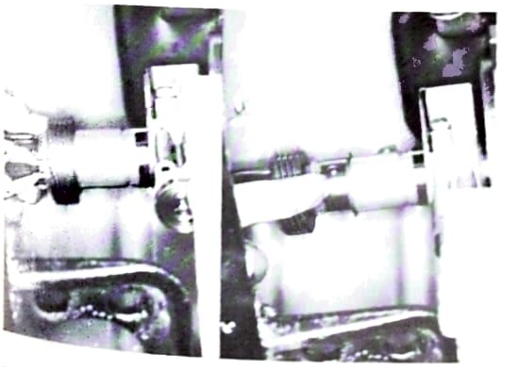
Place felt dust protector and washer on the end of the cable. Tighten the collar with pliers.

5. INSTALL PROPELLER SHAFT (See page 12-7)

6. LOWER VEHICLE AND CHECK FLUID LEVEL

Start the engine, shift the selector into each gear, then check the fluid level with the transmission in PARK. Add fluid as necessary.

CAUTION: Do not overfill.



REMOVAL OF GOVERNOR ASSEMBLY

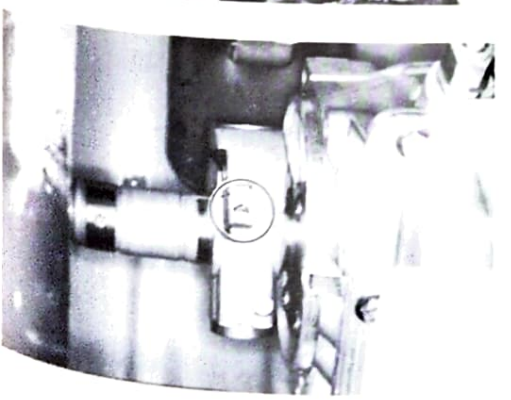
1. REMOVE EXTENSION HOUSING (See page 10-24)

2. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

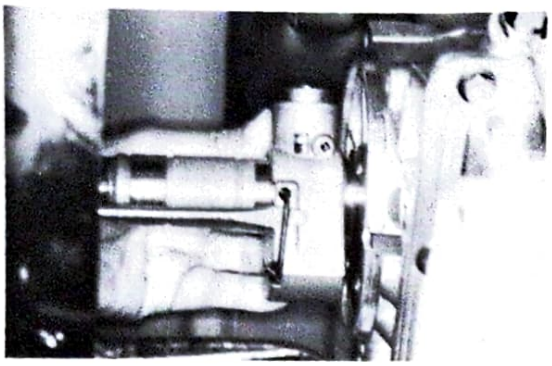
(b) Slide off the speedometer gear.

(c) Remove the lock ball and the other snap ring.



3. REMOVE GOVERNOR LOCK PLATE AND BOLT

Release the lock plate and remove the lock bolt.

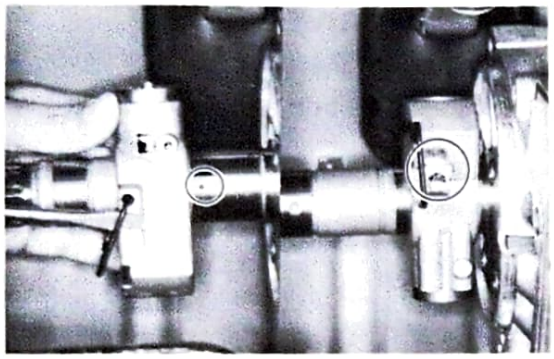


4. REMOVE GOVERNOR FROM OUTPUT SHAFT

Using a larger screwdriver, lift the retaining clip on the square side of the governor body and slide off of the shaft.

INSPECTION AND REPAIR OF GOVERNOR ASSEMBLY

(See page 10-105)



INSTALLATION OF GOVERNOR ASSEMBLY

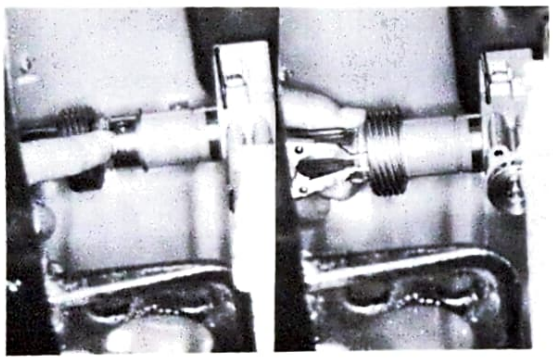
1. INSTALL GOVERNOR ON OUTPUT SHAFT

(a) Using a large screwdriver, lift the retaining clip, and slide the governor on the shaft with the retaining ring facing the end of the shaft.

(b) Release the retaining clip into the hole in the output shaft. Check that the governor assembly is secure.

2. INSTALL GOVERNOR LOCK PLATE AND BOLT

Tighten the lock bolt and secure with the lock plate.



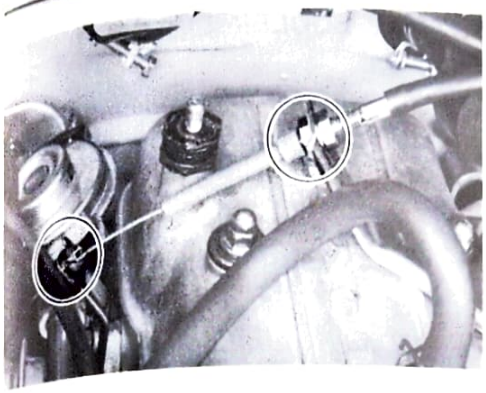
3. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the snap ring and lock ball.

(b) Slide the speedometer gear on the shaft.

(c) Using snap ring pliers, install the outer snap ring.

4. INSTALL EXTENSION HOUSING (See page 10-26)

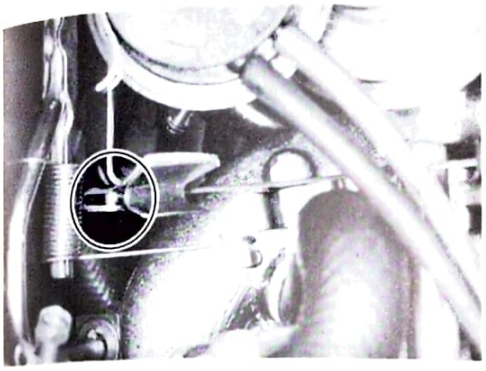


REMOVAL OF TRANSMISSION

1. DISCONNECT BATTERY CABLE FROM NEGATIVE ⊖ TERMINAL

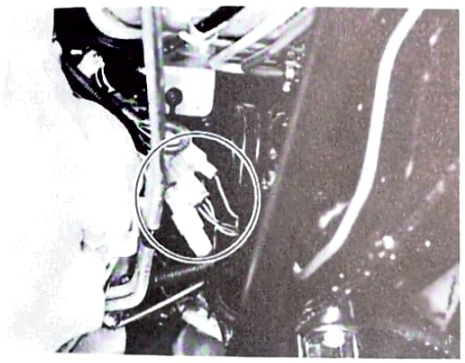
2. REMOVE AIR CLEANER ASSEMBLY

3. DISCONNECT TRANSMISSION THROTTLE CABLE
   (a) Loosen the adjusting nuts, and disconnect the cable housing from the bracket.
   (b) Remove the clip from the cable guide, and disconnect the guide grommet.
   (c) Disconnect the cable from the carburetor linkage.

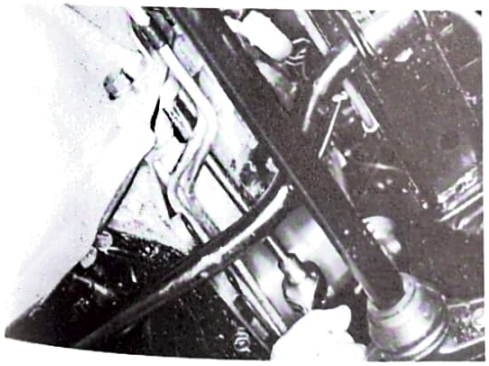


4. REMOVE UPPER MOUNTING NUT ON STARTER

5. RAISE VEHICLE AND DRAIN TRANSMISSION
   CAUTION: Be sure the vehicle is securely supported.

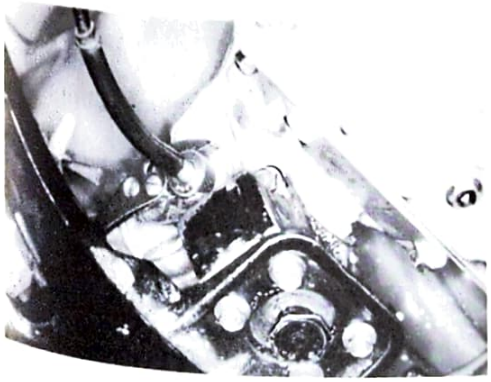


6. DISCONNECT WIRING CONNECTORS TO SOLENOID, NEUTRAL START AND BACK-UP LIGHT SWITCHES
   Disconnect the connectors located near the starter.



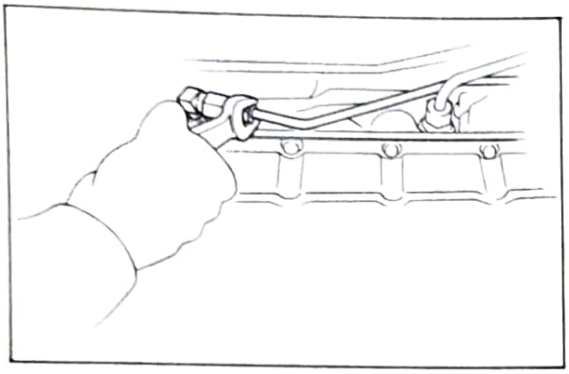
7. REMOVE STARTER
   (a) Remove the lower mounting bolt, and pull the starter toward the front of the vehicle.
   (b) Lay the starter alongside the engine.

8. REMOVE PROPELLER SHAFT (See page 12-3)

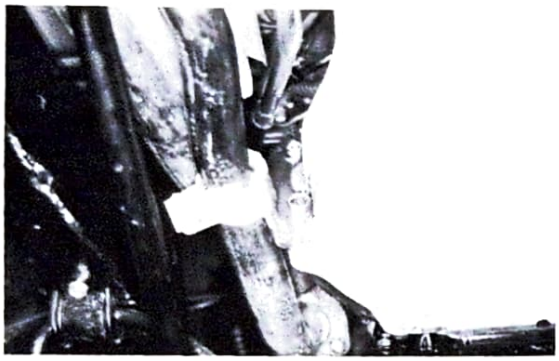


9. DISCONNECT SPEEDOMETER CABLE

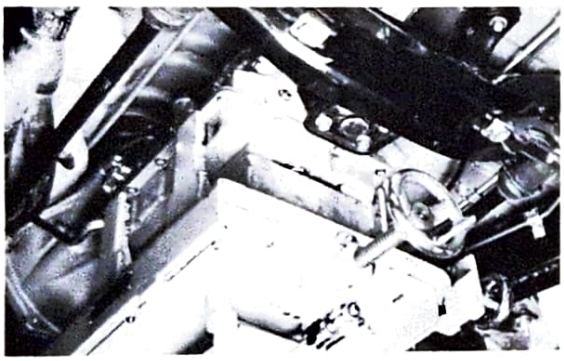
10. DISCONNECT MANUAL SHIFT LINKAGE
    Disconnect the shift linkage at the rear connection.



11. DISCONNECT TWO OIL COOLER LINES



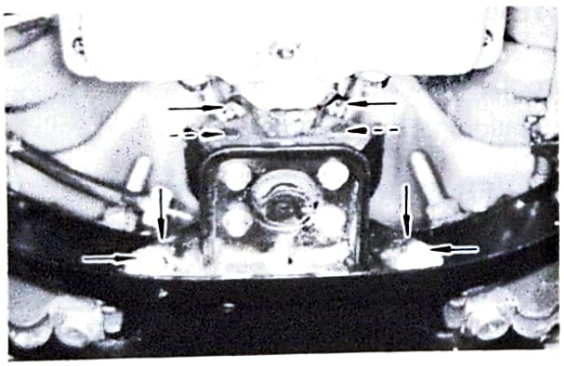
12. DISCONNECT EXHAUST PIPE CLAMP AND REMOVE OIL FILLER TUBE



13. JACK UP TRANSMISSION SLIGHTLY

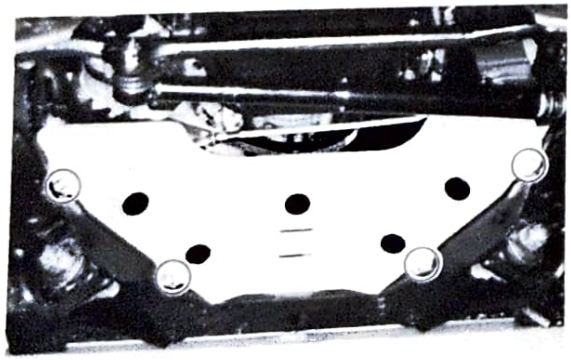
If a transmission jack is not available, be sure to put a wooden block between the jack and the transmission pan to prevent damage.

Raise the transmission enough to remove the weight from the engine rear mounting.



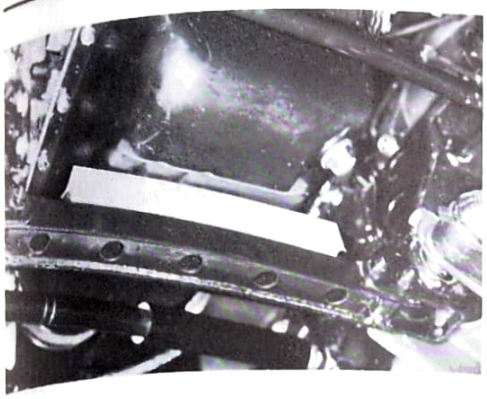
14. REMOVE ENGINE REAR MOUNTING WITH BRACKET

Remove eight bolts and the engine rear mounting with bracket.



15. REMOVE ENGINE UNDERCOVER

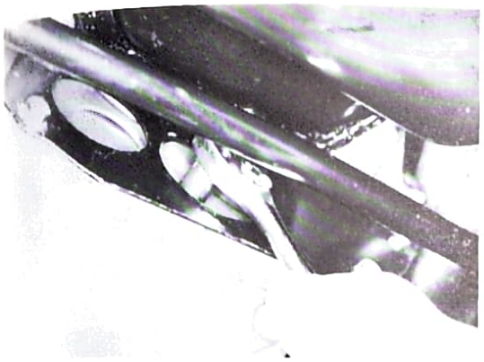
For rotating the engine and torque converter, remove the engine undercover to gain access to the crankshaft pulley.



16. INSERT WOODEN PIECE BETWEEN ENGINE OIL PAN AND MEMBER

(a) Insert wooden piece between the engine oil pan and member.

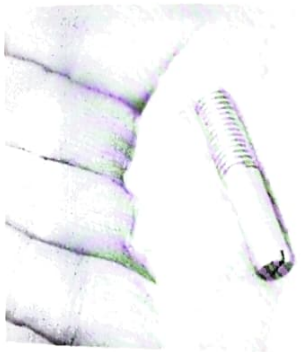
(b) Lower the transmission and rest the engine on the member.



17. REMOVE SIX TORQUE CONVERTER MOUNTING BOLTS

(a) Pry out the two rubber plugs from the service holes at the rear of the engine.

(b) Turn the crankshaft to gain access to each bolt. Remove six bolts.



18. INSTALL GUIDE PIN IN TORQUE CONVERTER

Install the guide pin in one of the torque converter bolt holes.

If necessary, a guide pin can be made by cutting off the head of a bolt.

19. REMOVE TRANSMISSION HOUSING MOUNTING BOLTS

20. PRY ON END OF GUIDE PIN TO BEGIN MOVING TRANSMISSION WITH CONVERTER TOWARD REAR

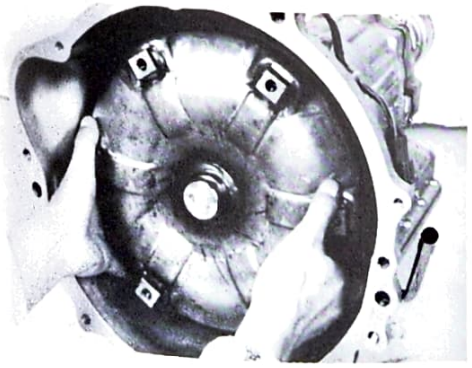
The guide pin helps keep the converter with the transmission.

21. REMOVE TRANSMISSION ASSEMBLY

Draw out the transmission toward the rear.

CAUTION: Do not let the throttle cable or neutral start switch cable catch on anything. Keep the oil pan positioned down.

Be careful not to let the torque converter slide out.

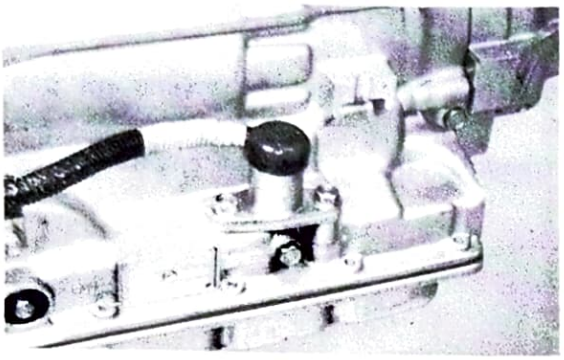


22. PLACE PAN UNDER CONVERTER HOUSING AND REMOVE CONVERTER

Pull the converter straight off, and allow fluid to drain into the pan.

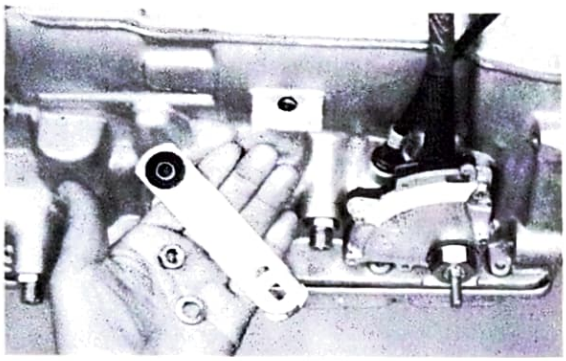
DISASSEMBLY OF TRANSMISSION

SEPARATE BASIC SUBASSEMBLY



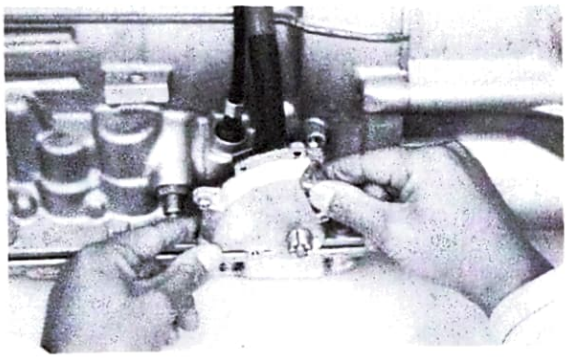
1. REMOVE SOLENOID

After removing two bolts, remove the solenoid.



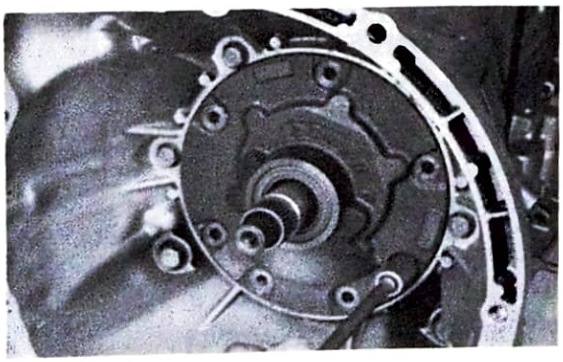
2. REMOVE SHIFT HANDLE

Remove nut on shaft and pull off handle.



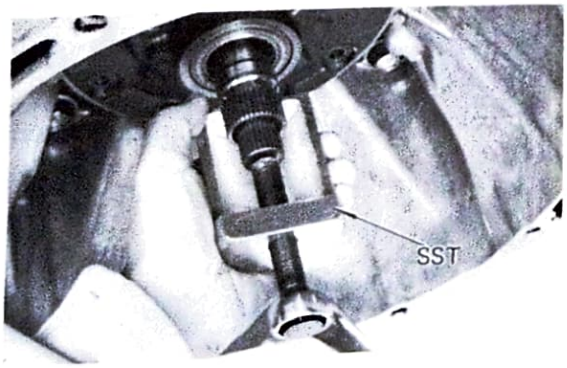
3. REMOVE NEUTRAL START SWITCH

Remove nut and pull off neutral start switch.



4. REMOVE OIL PUMP AND BELL HOUSING

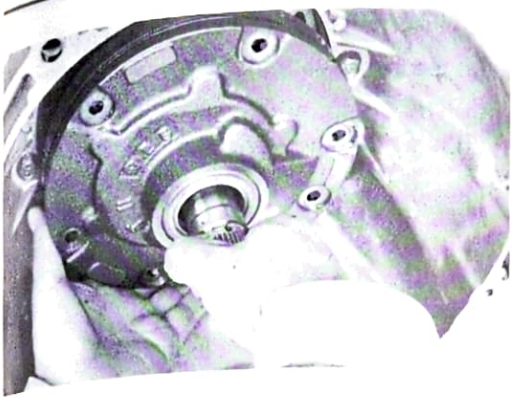
(a) Remove seven bolts of oil pump housing.



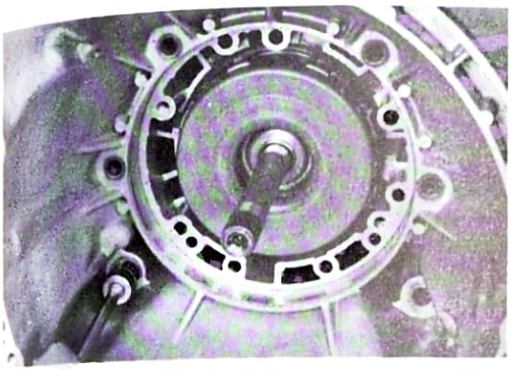
(b) Position puller* on shaft in back of the splines.

CAUTION: Do not damage shaft bushing surface. Turn end bolt of puller to free pump. Remove the puller.

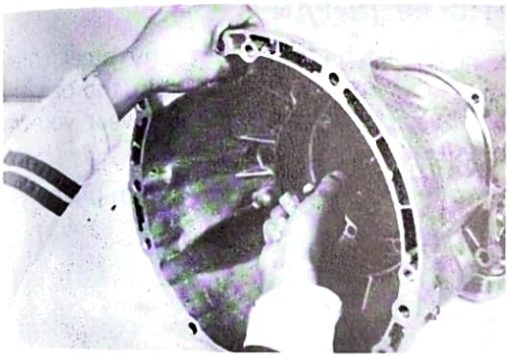
*SST 09610-20011



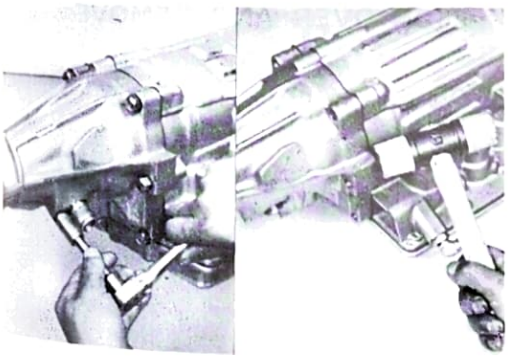
(c) Grasp the pump stator shaft and pull pump from case.



(d) Remove two short bolts and four long bolts of bell housing.



(e) While holding the input shaft, remove the bell housing.

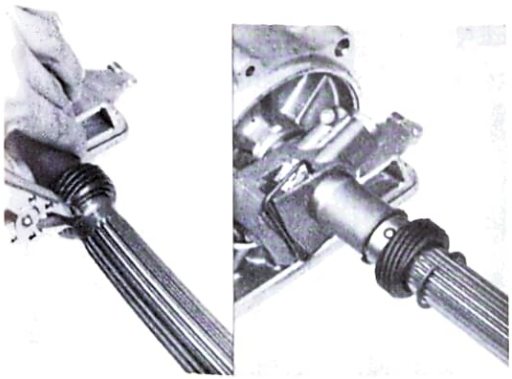


5. REMOVE SPEEDOMETER DRIVEN GEAR SLEEVE

Remove the locking tab and pry out the gear sleeve with a medium-sized screwdriver.

6. REMOVE EXTENSION HOUSING AND GASKET

Remove six bolts. To loosen the housing, tap it lightly with a soft-faced hammer or a block of wood.

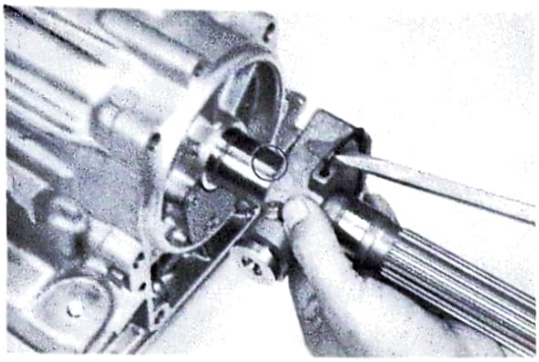


7. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

(b) Remove the speedometer drive gear and lock ball from the output shaft.

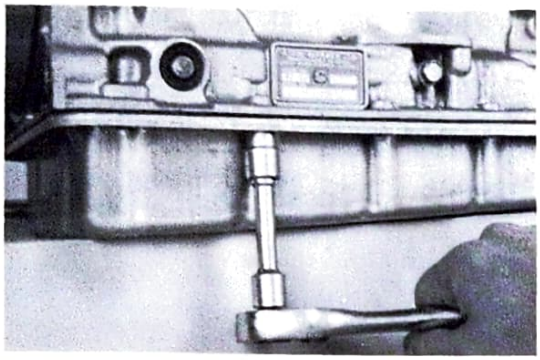
(c) Remove the other snap ring.



8. REMOVE GOVERNOR FROM OUTPUT SHAFT

(a) Remove the governor valve lock bolt.

(b) While lifting the retaining clip with a larger screwdriver, slide off the governor valve.

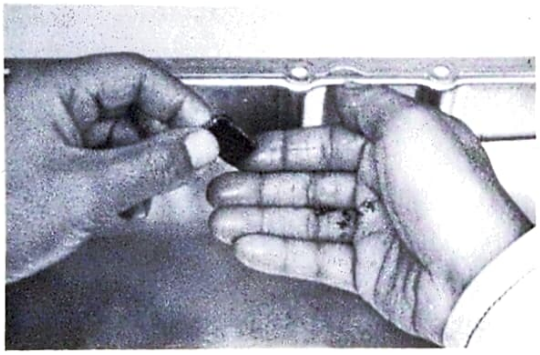


9. REMOVE PAN AND GASKET

(a) Remove fourteen bolts.

(b) Remove the pan by lifting the transmission case.

CAUTION: Do not turn the transmission over as this will contaminate the valve body with foreign materials in the bottom of the pan.

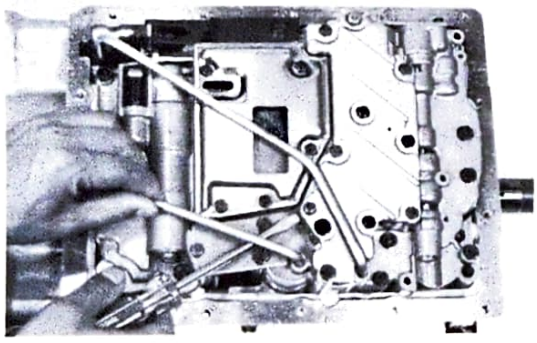


10. EXAMINE PARTICLES IN PAN

Remove magnet and use it to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnet to anticipate what type of wear you will find in the transmission:

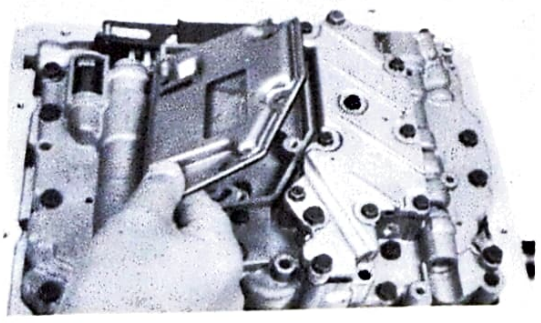
Steel (magnetic) = bearing, gear and clutch plate wear.

Brass (nonmagnetic) = bushing wear.



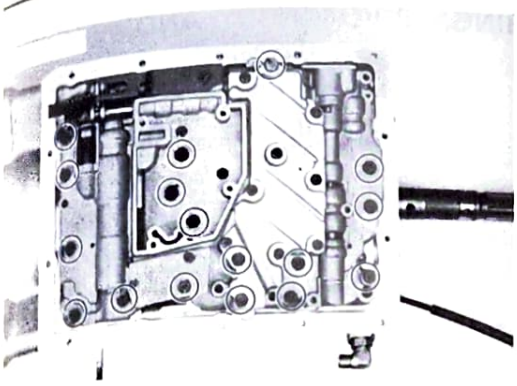
11. TURN TRANSMISSION OVER AND REMOVE TUBES

Pry up both ends of tubes with a larger screwdriver and remove the tubes.



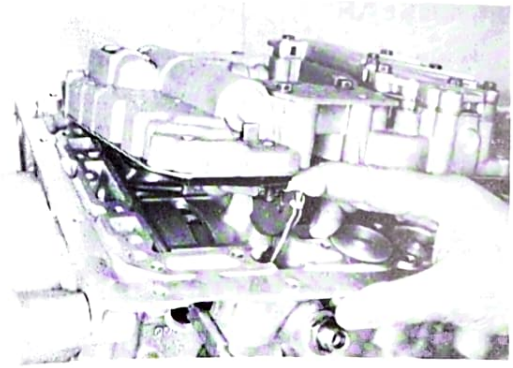
12. REMOVE SCREEN

Remove five bolts, and lift off screen.

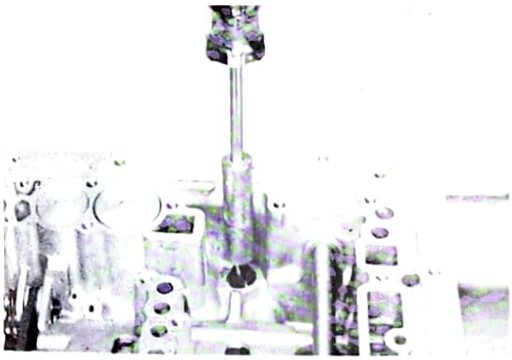


13. REMOVE VALVE BODY

(a) Remove seventeen bolts

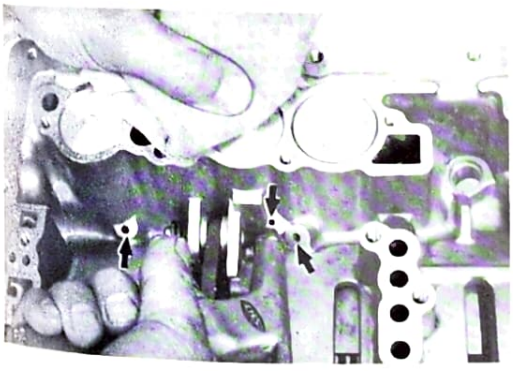


(b) Disconnect the throttle cable from the cam and remove the valve body.



14. REMOVE THROTTLE CABLE AND RETAINER

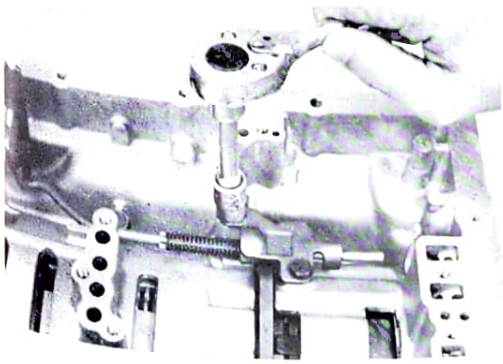
Using a 10 mm socket, push the plastic throttle cable retainer out of the transmission case.



15. REMOVE ACCUMULATOR PISTONS AND SPRINGS

WARNING: Keep face away to avoid injury. Do not use high-pressure air.

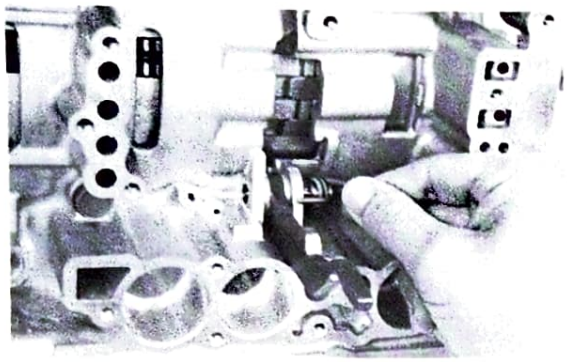
Position a rag to catch each piston. Using low-pressure compressed air (1 kg/cm^2 or 14 psi, max), pop each piston into the rag. Force air into holes shown, and remove pistons and springs.



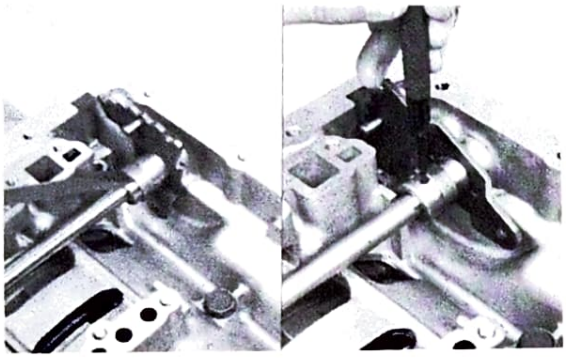
16. REMOVE PARKING LOCK ROD

(a) Remove two bolts and the parking lock pawl bracket.

(b) Remove the lock rod after aligning the lugs with the slots of manual valve lever.



17. REMOVE SPRING, PIVOT PIN AND PARKING LOCK PAWL



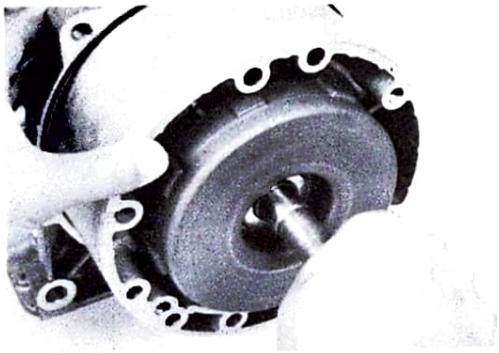
18. PRY AND SHIFT COLLAR

Using a hammer and chisel, pry and shift the collar.

19. DRIVE OUT ROLL PIN AND REMOVE MANUAL VALVE LEVER SHAFT

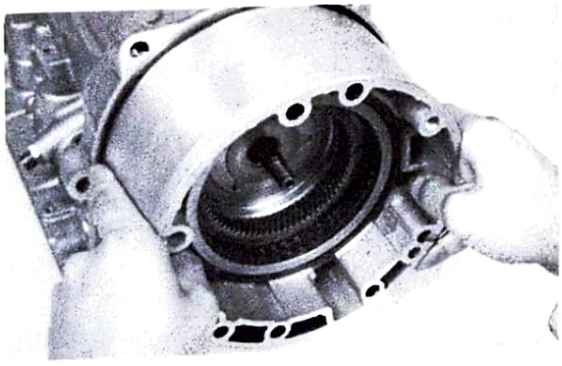
Using a hammer and punch, drive out pin.

Turn transmission assembly over.



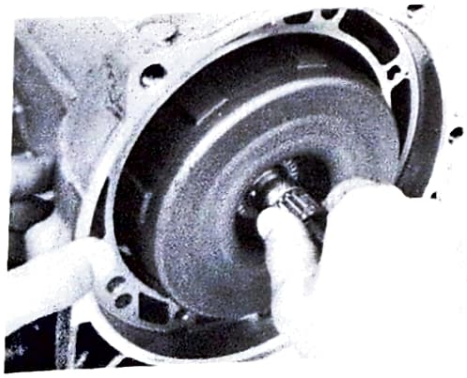
20. REMOVE OD CLUTCH

Grasp the shaft and pull out the OD clutch.



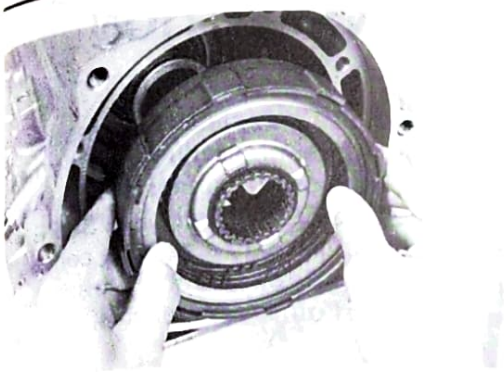
21. REMOVE OD CASE AND BRAKE

Hold both sides of the OD case and pull out from the transmission case while watching for bearings and races on both sides of assembly.



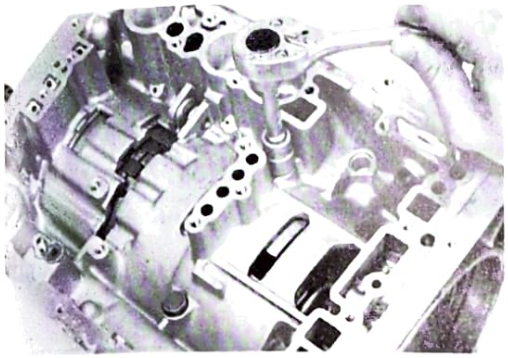
22. REMOVE FRONT CLUTCH AND BEARINGS

Grasp the shaft and pull out front clutch assembly while watching for bearings and races on both sides of assembly.



23. REMOVE REAR CLUTCH

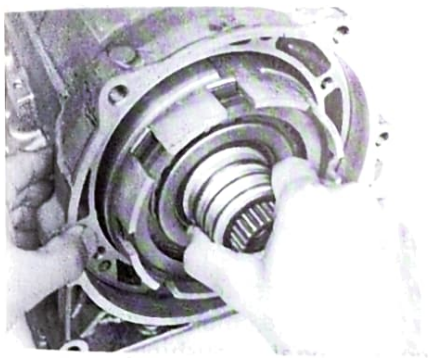
Grasp the clutch hub and pull out from case.



24. REMOVE CENTER SUPPORT BOLTS

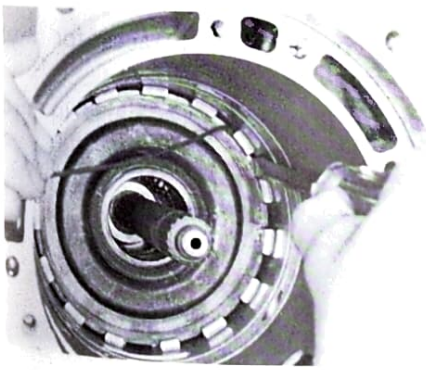
Remove the two center support bolts.

NOTE: After removing one bolt, the other one will be loose, but this is normal.



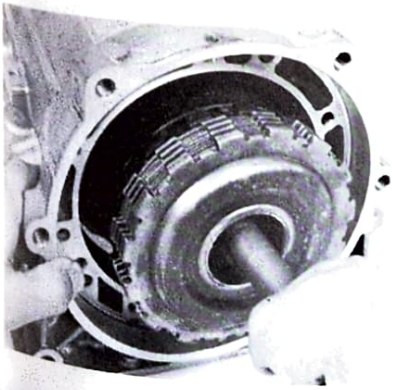
25. REMOVE CENTER SUPPORT AND SUN GEAR ASSEMBLY

From the case front opening, grasp the assembly and pull out.



26. REMOVE REACTION PLATE RETAINING RING

Using a long screwdriver, compress the snap ring and lift it above the groove with a wire hook.



27. REMOVE REAR PARTS GROUP

Grasp the intermediate shaft and pull out the rear parts group. If the brake apply tube and rear thrust bearing and races do not come out with the assembly, remove them from the case.

COMPONENT GROUP DISASSEMBLY, INSPECTION AND ASSEMBLY

IMPORTANT NOTE: The instructions here are organized so that you work on only one component at a time. This will help avoid confusion from similar-looking parts from different components being on your workbench at the same time.

The components are inspected and repaired from bell housing side.

As much as possible, complete the inspection, repair, assembly before proceeding to the next component. If a component cannot be assembled because parts are being ordered, BE SURE to keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other components.

GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean and the fluid passages and holes blown through with compressed air to make sure that they are not clogged.
2. Cleaning solvent used should be recommeded automatic transmission fluid or kerosene.
3. When using compressed air to dry parts, keep face away to avoid spraying solvent in your face.

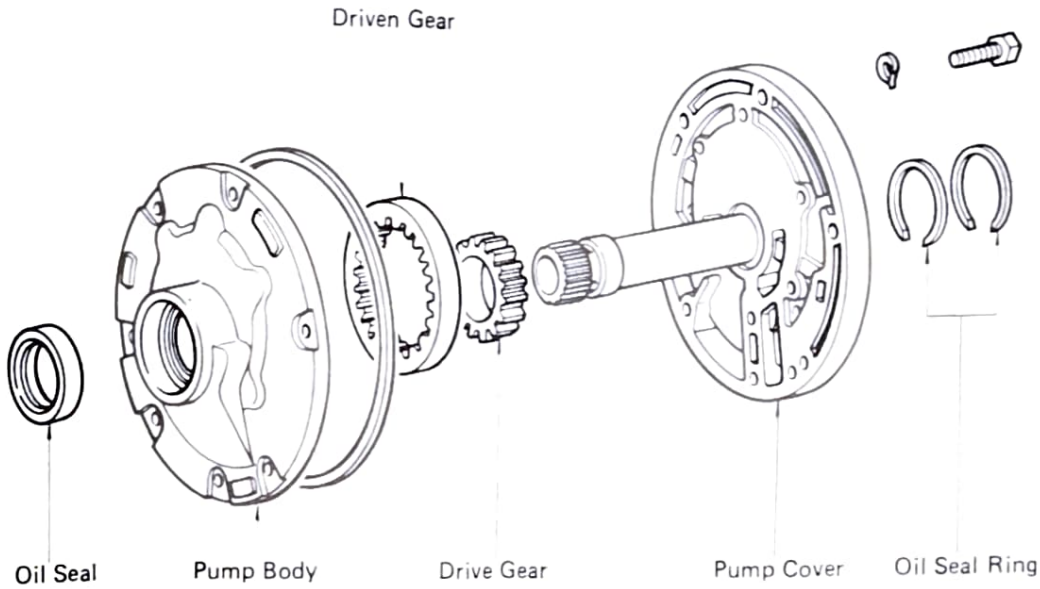
PARTS HOLDING NOTES:

1. The parts after cleaning should be arranged in proper order to allow performing the inspection, repairs, and reassembly with efficiency.
2. New brakes and clutches that are to be used for replacement must be soaked in transmission fluid for at least two hours before assembly.
3. When disassembling valve body, be sure to keep each valve together with corresponding spring.

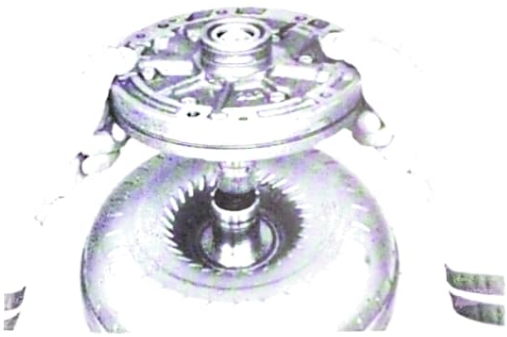
GENERAL ASSEMBLY NOTES:

1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.
2. If a worn bushing is to be replaced, the replacement must be made with the subassembly containing that bushing.
3. All gaskets and rubber oil seals should be replaced if excessively damaged.
4. Check thrust bearings and races for wear and damage. Replace if necessary.
5. Make sure that the ends of snap ring are not in an open notch and are installed in groove correctly.
6. Use petroleum jelly to keep parts in their places.

Oil Pump

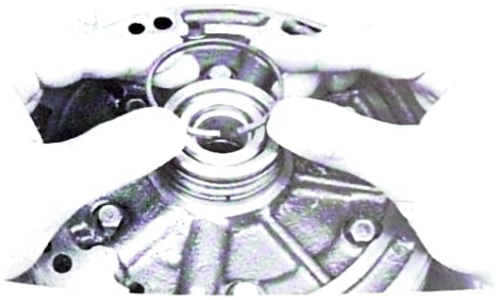


DISASSEMBLY OF OIL PUMP



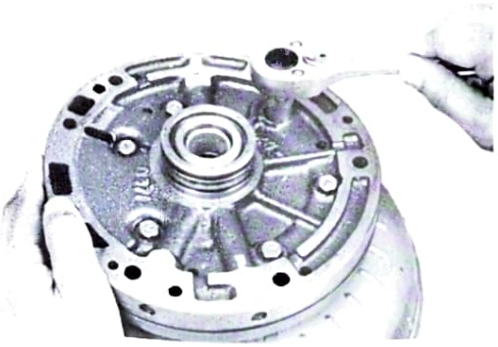
1. USE TORQUE CONVERTER AS A WORK STAND

   Set oil pump on the torque converter.



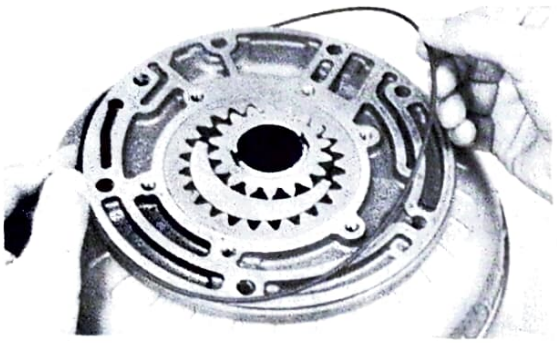
2. REMOVE TWO OIL SEAL RINGS FROM PUMP COVER

   Unlock, spread and slide off by hand.



3. UNBOLT AND REMOVE PUMP COVER

   Remove six bolts with washers from the oil pump cover. Lift off the cover.



4. REMOVE O-RING FROM PUMP

Pull off and discard.

5. LIFT PUMP OFF CONVERTER AND REMOVE OIL PUMP DRIVE GEAR AND DRIVEN GEAR

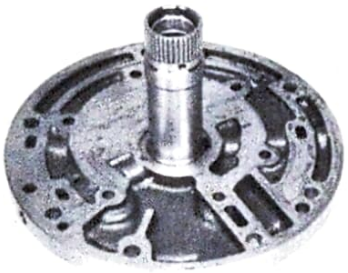
Lift out by hand. Identify the top and bottom and keep in assembly order.

INSPECTION OF OIL PUMP

1. THOROUGHLY WASH ALL PARTS IN SOLVENT

Use clean solvent. Be careful not to scratch mating surfaces of pump. Dry all parts with compressed air. Do not use towels or rags to dry parts.

CAUTION: To prevent deterioration, do not clean the oil seal with solvent.



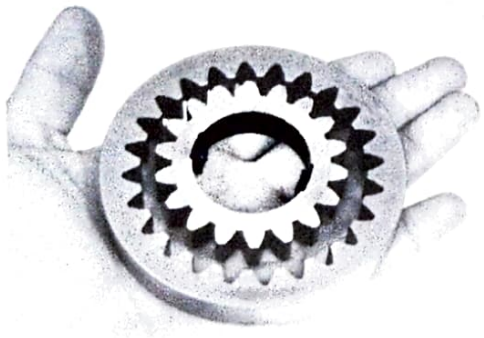
2. INSPECT PUMP BODY AND COVER

(a) Check interior surfaces where gears contact for wear or ridges.

(b) Check overall for cracks, scores or damage.

(c) Check bushing and oil seal grooves for wear or damage.

(d) Check stator shaft surface and splines for wear or damage.

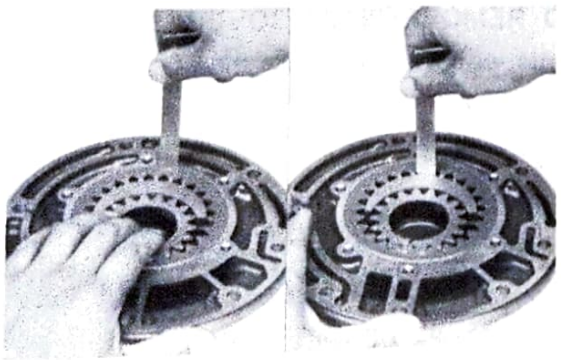


3. INSPECT DRIVE AND DRIVEN GEARS

Check teeth and all surfaces for wear, scores, ridges, cracks or other damage.

4. INSTALL DRIVEN GEAR AND DRIVE GEAR INTO PUMP BODY

Set into place for clearance measurements. Make sure top side of gears is facing up.



5. CHECK CLEARANCE BETWEEN BODY AND DRIVEN GEAR

Push driven gear to one side of body. Using a feeler gauge, check clearance.

Body clearance: 0.07 – 0.15 mm (0.0028 – 0.0059 in.)

6. CHECK TIP CLEARANCE OF BOTH GEARS

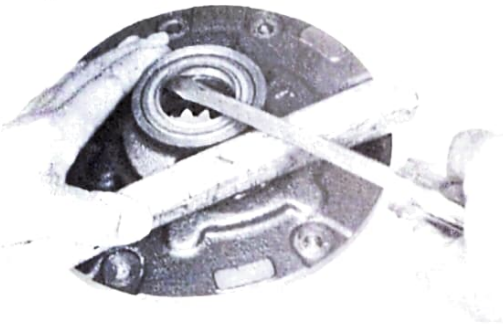
Measure between the gear teeth and the cresent-shaped part of the pump body.

Tip clearance: 0.11 – 0.14 mm (0.0043 – 0.0055 in.)

7. CHECK SIDE CLEARANCE OF BOTH GEARS

Using a steel straightedge and a feeler gauge, measure the side clearance of both gears.

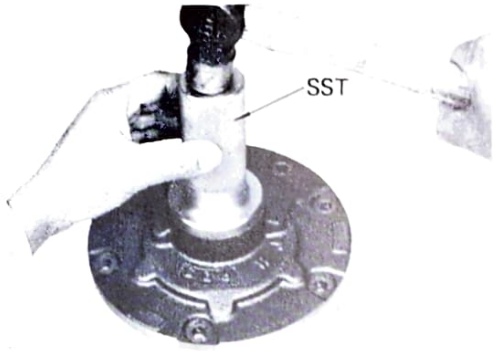
Side clearance: 0.02 – 0.05 mm (0.0008 – 0.0020 in.)



8. INSPECT FRONT OIL SEAL

Check for wear, damage and cracks. Replace the oil seal as follows, if necessary.

(a) Pry off the oil seal with a screwdriver.



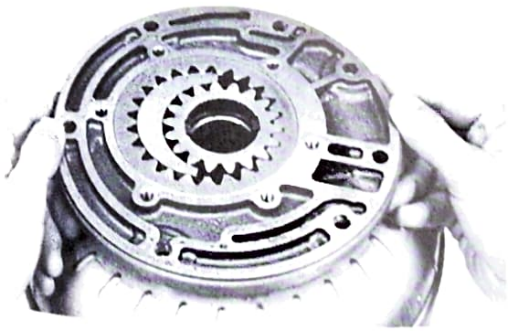
(b) Using a driver* and hammer, install a new oil seal. The seal end should be flush with outer edge of pump body.

*SST 09350-20013 or Commercial driver

ASSEMBLY OF OIL PUMP
(See illustration on page 10-37)

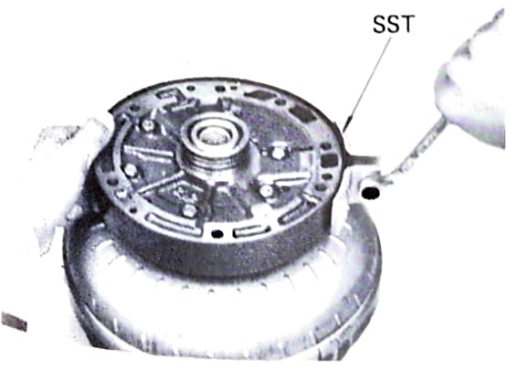
GENERAL ASSEMBLY NOTE:

Coat all sliding and meshing surfaces with ATF during assembly.



1. INSTALL DRIVEN GEAR AND DRIVE GEAR AND SET PUMP BODY ON TORQUE CONVERTER

Make sure the top of the gears is facing up.



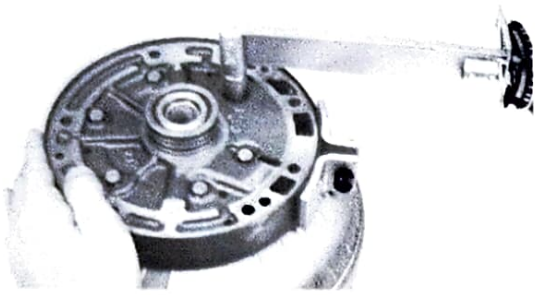
2. LOOSELY INSTALL PUMP COVER

Align bolt holes and drop pump cover into place. Install six bolts with wave washers finger tight.

3. ALIGN PUMP AND PUMP COVER

Install alignment band* around pump and cover.
Tighten SST to align pump and cover.

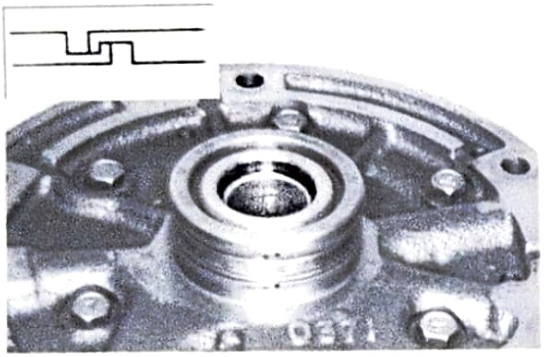
*SST 09350-20013



4. **TIGHTEN SIX PUMP COVER BOLTS**

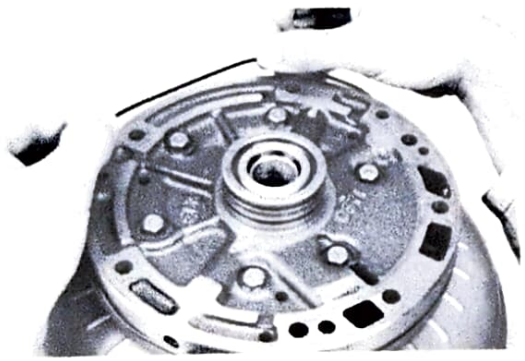
Tighten pump cover bolts. Remove SST.

Torque: 0.6 – 0.9 kg-m (53 – 78 in.-lb)



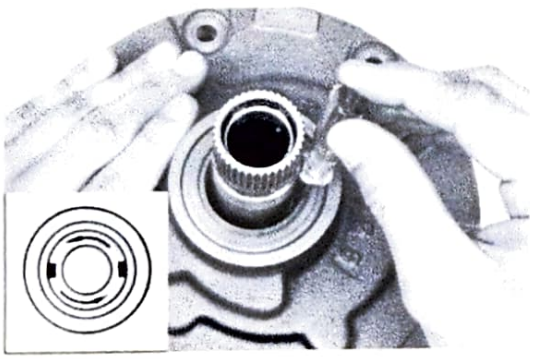
5. **INSTALL TWO NEW OIL SEAL RINGS ON PUMP COVER**

Spread and slip into grooves. Press rings into place, flush with outer surface of the grooves.



6. **INSTALL NEW O-RING ON PUMP**

Install in groove by hand. Lubricate with ATF. Make sure the O-ring is not twisted and is fully seated in the groove. Remove pump from the converter for the next step.

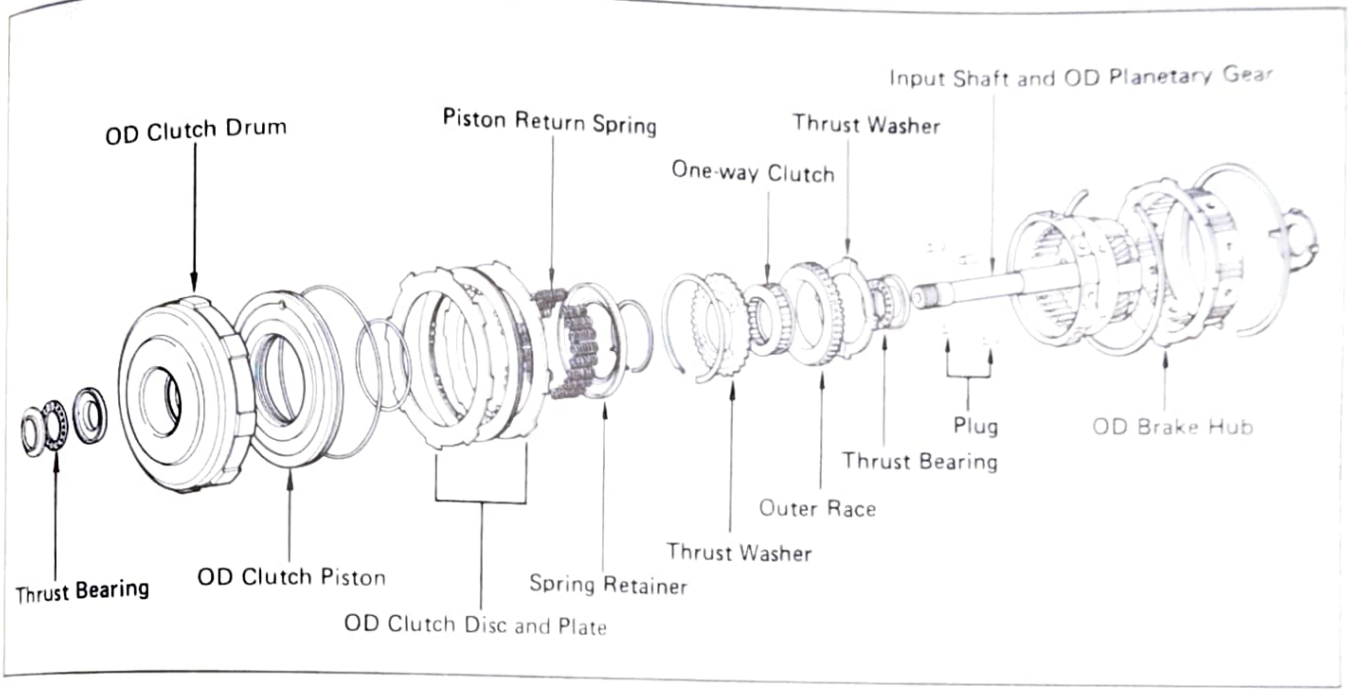


7. **CHECK DRIVE GEAR ROTATION**

Turn the drive gear with a screwdriver and make sure that it rotates smoothly.

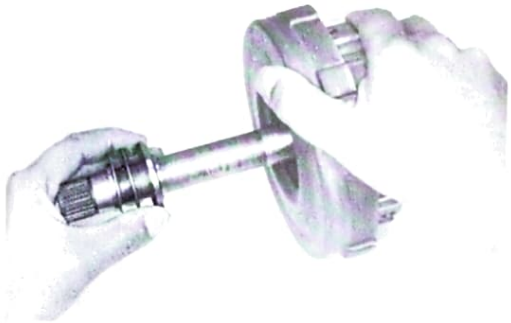
NOTE: Do not damage the oil seal lip.

OD Input Shaft and Clutch

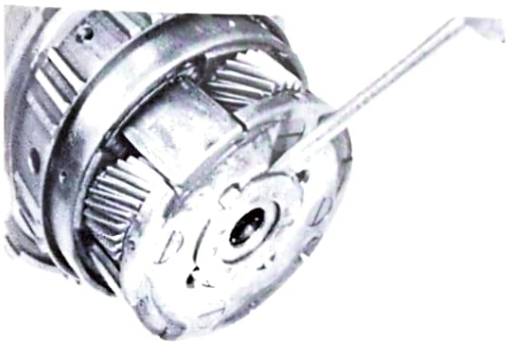


DISASSEMBLY OF OD INPUT SHAFT AND CLUTCH

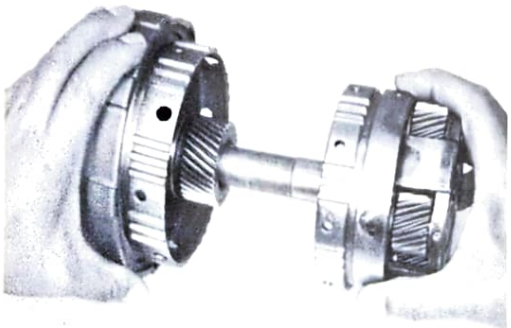
1. REMOVE THRUST BEARING AND RACE FROM BOTH SIDES OF CLUTCH



(a) Slide off the thrust bearing and race from clutch side by hand. Note position of cup.



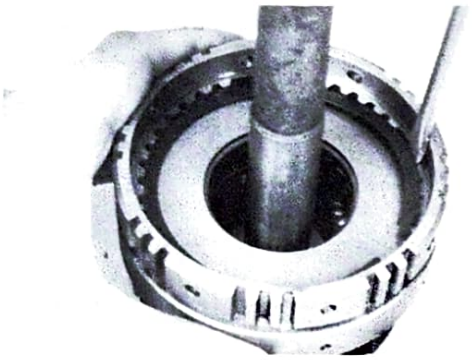
(b) Pry off the thrust washer from planetary gear side using a screwdriver.



2. PULL OD CLUTCH ASSEMBLY FROM INPUT SHAFT

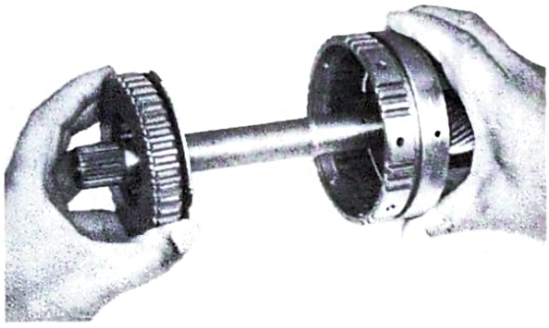
CAUTION: Be careful that the thrust bearing and race do not fall out.

3. REMOVE THRUST BEARING AND RACE



4. **REMOVE SNAP RING FROM OD PLANETARY GEAR ASSEMBLY**

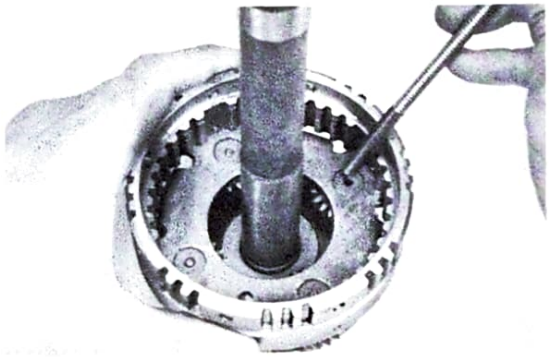
Using a medium screwdriver, compress the snap ring and lift out.



5. **REMOVE THRUST WASHERS AND ONE-WAY CLUTCH FROM PLANETARY GEAR ASSEMBLY**

Lift out by hand.

CAUTION: Be careful not to lose four plugs.



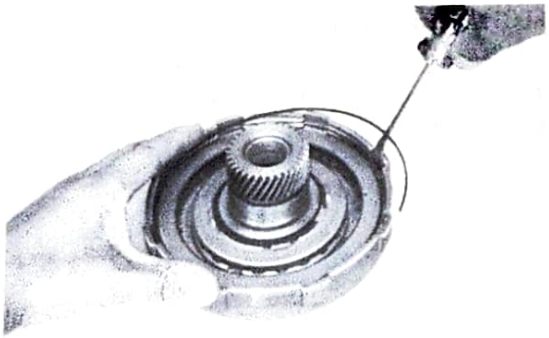
6. **REMOVE FOUR PLUGS BY MAGNET HAND**

CAUTION: Keep the four plugs together to prevent losing them.

7. **REMOVE SNAP RING AND HUB FROM OD CLUTCH ASSEMBLY**

(a) Using a screwdriver, compress the snap ring and lift out.

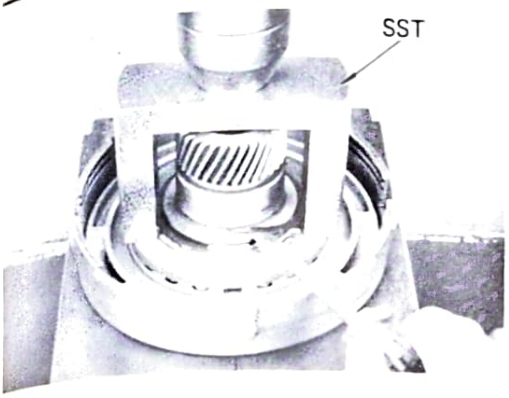
(b) Lift off hub by hand.



8. **REMOVE SNAP RING, DISC AND PLATE**

(a) Using a screwdriver, compress the snap ring and lift out.

(b) Lift out one disc and two plates by hand.



9. COMPRESS PISTON RETURN SPRINGS AND REMOVE SNAP RING

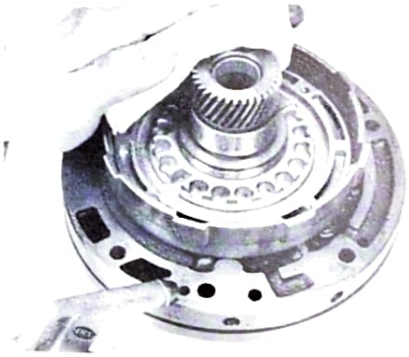
(a) Place spring compressor* on spring retainer and compress springs with a shop press. Using a screwdriver, compress the snap ring and lift out.

(b) Carefully remove SST.

*SST 09350-20013 or 00002-00223-04

10. REMOVE SNAP RING, SPRING RETAINER AND EIGHTEEN SPRINGS

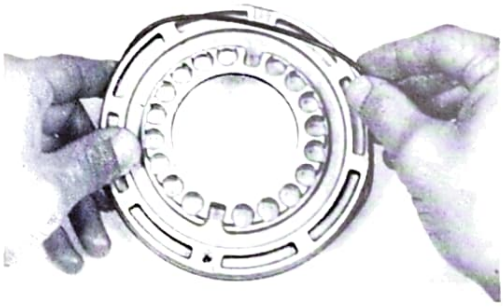
Lift off by hand.



11. REMOVE CLUTCH PISTON

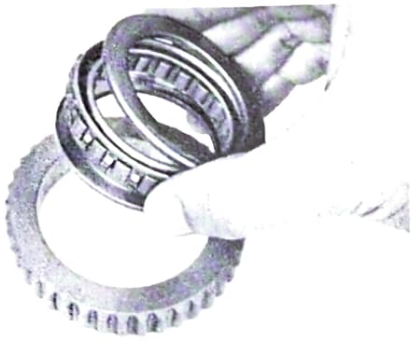
Install the clutch drum onto the oil pump body. Apply compressed air through the oil pump hole to remove the piston.

If piston does not come out completely, use pliers to remove it.



12. REMOVE CLUTCH PISTON O-RINGS

Remove both inner and outer rings by hand. Discard O-rings.



13. REMOVE ONE-WAY CLUTCH FROM OUTER RACE

Note direction of one-way clutch.

INSPECTION OF OD INPUT SHAFT AND CLUTCH

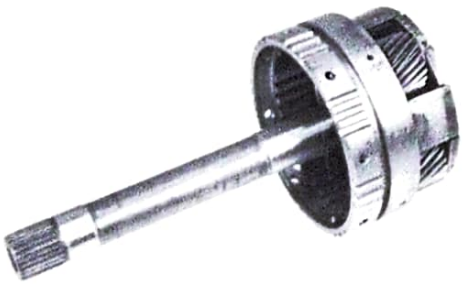
1. THOROUGHLY CLEAN ALL PARTS – EXCEPT DISCS – IN SOLVENT

Use only fresh, clean solvent. Maintain order of parts during cleaning. Dry all parts with compressed air.

2. INSPECT ONE-WAY CLUTCH

Check sprags, ribon spring and end surfaces for wear or damage.

3. INSPECT OD PLANETARY GEAR



(a) Check pinion gear for wear, damage or rotating condition.

(b) Check lugs for wear or damage.

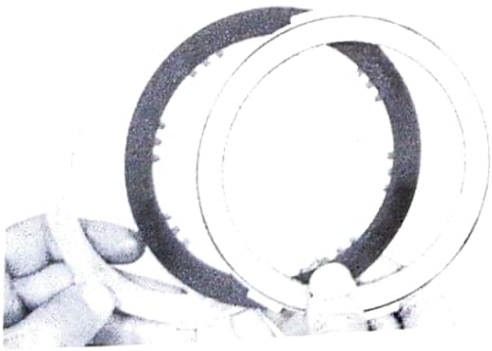
(c) Check snap ring groove for wear or damage.

(d) Check splines for wear or damage.

4. INSPECT CLUTCH DRUM

Check gear teeth, piston sliding surface, inner lug surface, thrust bearing surface, snap ring groove, bushing surface and oil seal ring sliding surface for wear or damage.

5. INSPECT FLANGE, DISC AND PLATE



(a) Check outer and inner lugs for wear.

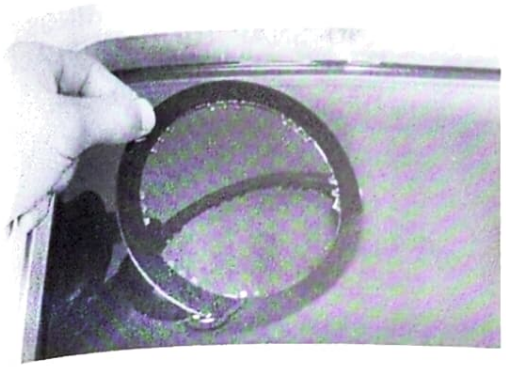
(b) Check surfaces for burning (black appearance).

(c) Check disc friction surfaces for scoring, flacking and debonding.

(d) Check for warpage.

(e) Measure disc thickness. Minimum allowable thickness is 2.1 mm (0.083 in.).

(f) Replace all worn or damaged parts.



6. DO NOT ALLOW DISC TO DRY OUT; SOAK NEW DISC IN ATF

Keep a disc being reused from drying out. If necessary, immerse in ATF. Prepare a new disc by soaking at least two hours in ATF.

7. INSPECT CLUTCH PISTON

(a) Check sliding surfaces and O-ring grooves for wear or damage.

(b) Shake piston to make sure check ball is free, and check that valve does not leak by applying low-pressure air.

8. INSPECT RETURN SPRINGS AND RETAINER

Check for equal height and for broken springs.

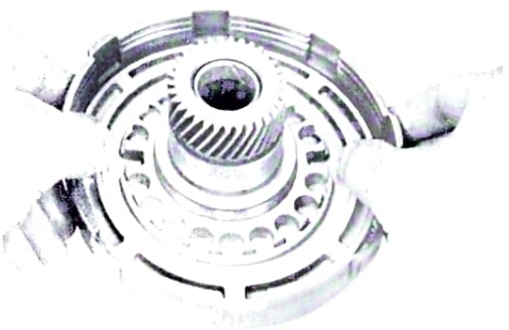
Check retainer for wear or damage.

ASSEMBLY OF OD INPUT SHAFT AND CLUTCH

(See illustration on page 10-41)

GENERAL ASSEMBLY NOTE:

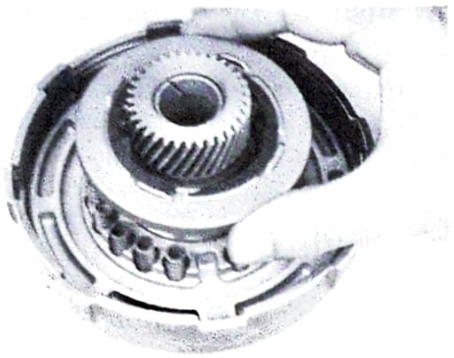
Coat all friction surfaces, bearing races, sliding surfaces and O-rings with ATF during assembly.



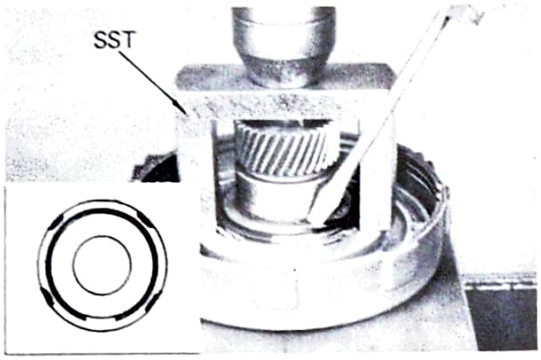
1. INSTALL CLUTCH PISTON IN OD CLUTCH DRUM

(a) Install new O-ring on the piston. Coat O-ring with ATF.

(b) Press piston into the drum with cup side up being careful not to damage O-ring.



2. INSTALL EIGHTEEN PISTON RETURN SPRINGS AND SET RETAINER AND SNAP RING IN PLACE

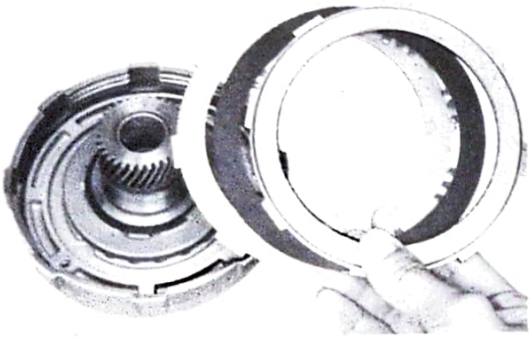


3. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

(a) Place spring compressor* on top of the retainer, and compress springs on shop press.

*SST 09350-20013 or 00002-00223-04

(b) Install snap ring with a screwdriver. Remove SST.

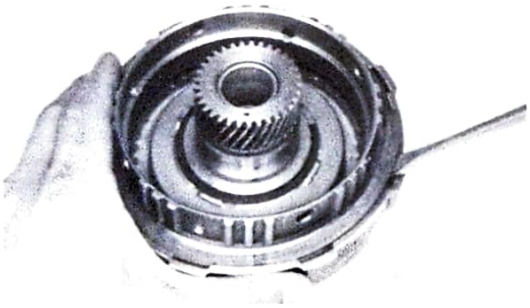


4. INSTALL PLATE, DISC AND FLANGE

Install a plate, a disc and a flange in following order.

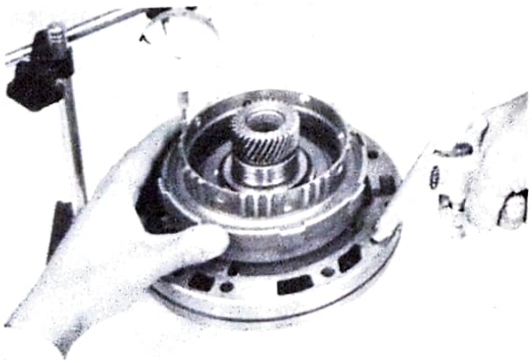
CAUTION: **Do not install thinner snap ring.**

Plate-disc-flange (no snap ring).



5. INSTALL OD CLUTCH HUB AND OUTER SNAP RING

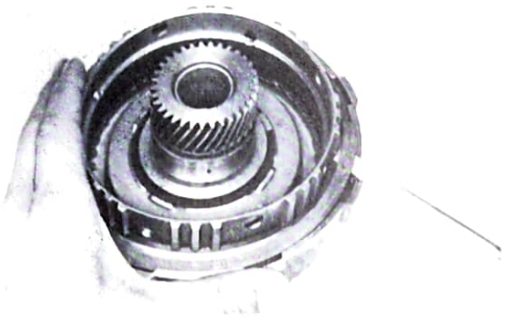
Check that the ends of the snap ring are not aligned with one of the cutouts.



6. CHECK PISTON STROKE OF OD CLUTCH

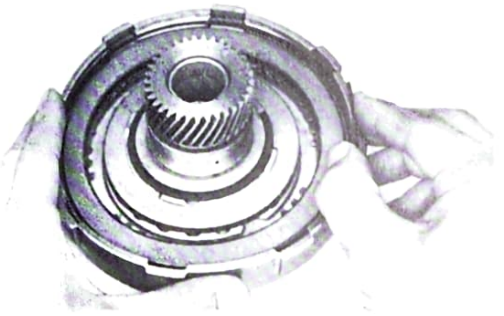
Install OD clutch drum onto the oil pump body. With a dial indicator, apply 4 – 8 kg/cm² (57 – 114 psi) of compressed air and measure the stroke as shown.

Stroke: 1.55 – 2.28 mm (0.0610 – 0.0898 in.)



7. REMOVE SNAP RING AND HUB TO ALLOW INSTALLATION OF INNER SNAP RING

Compress outer snap ring with a screwdriver and lift out. Lift off hub.

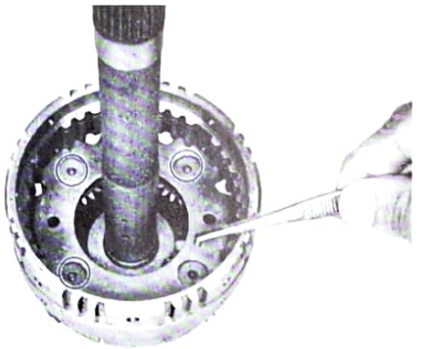


8. INSTALL THIN INNER SNAP RING IN CLUTCH DRUM

Compress and lower into groove by hand. Check that the ends of the snap ring are not aligned with one of the cutouts.

9. INSTALL HUB AND OUTER SNAP RING

Check that the ends of the snap ring are not aligned with one of the cutouts.

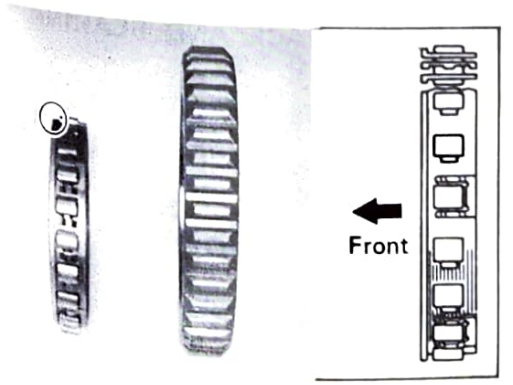


10. INSTALL FOUR PLUGS

11. INSTALL THRUST WASHER AND BEARING

(a) Coat parts with petroleum jelly to keep them in place.

(b) Slip bearing and then thrust washer facing lip outward.

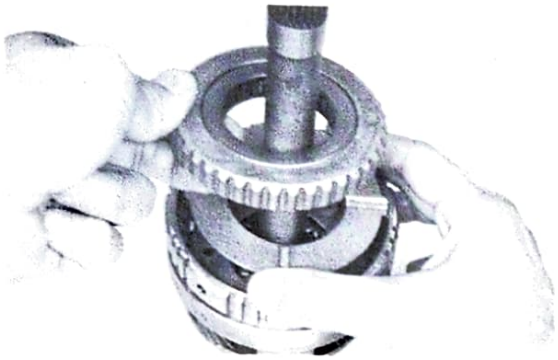


12. INSTALL ONE-WAY CLUTCH

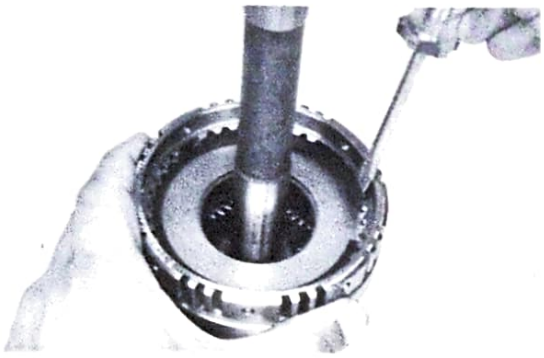
(a) Install the one-way clutch into the outer race.

(b) Install a retainer on both sides of the one-way clutch.

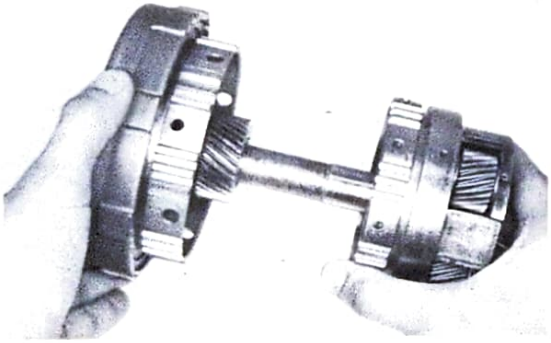
NOTE: Remember that the spring cage side of the one-way clutch faces toward the front of the transmission.



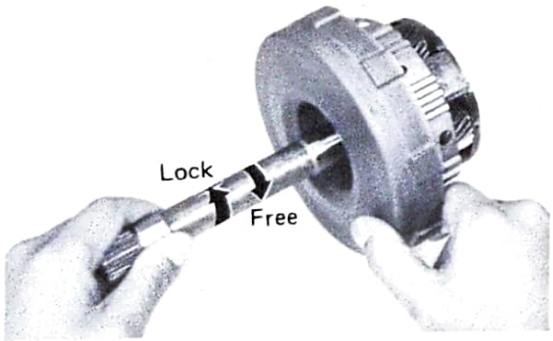
13. INSTALL THRUST WASHER AND ONE-WAY CLUTCH
    (a) Install thrust washer, facing grooves upward.
    (b) Install one-way clutch in correct direction.



14. INSTALL THRUST WASHER AND SNAP RING
    Check that the ends of the snap ring are not aligned with one of the cutouts.



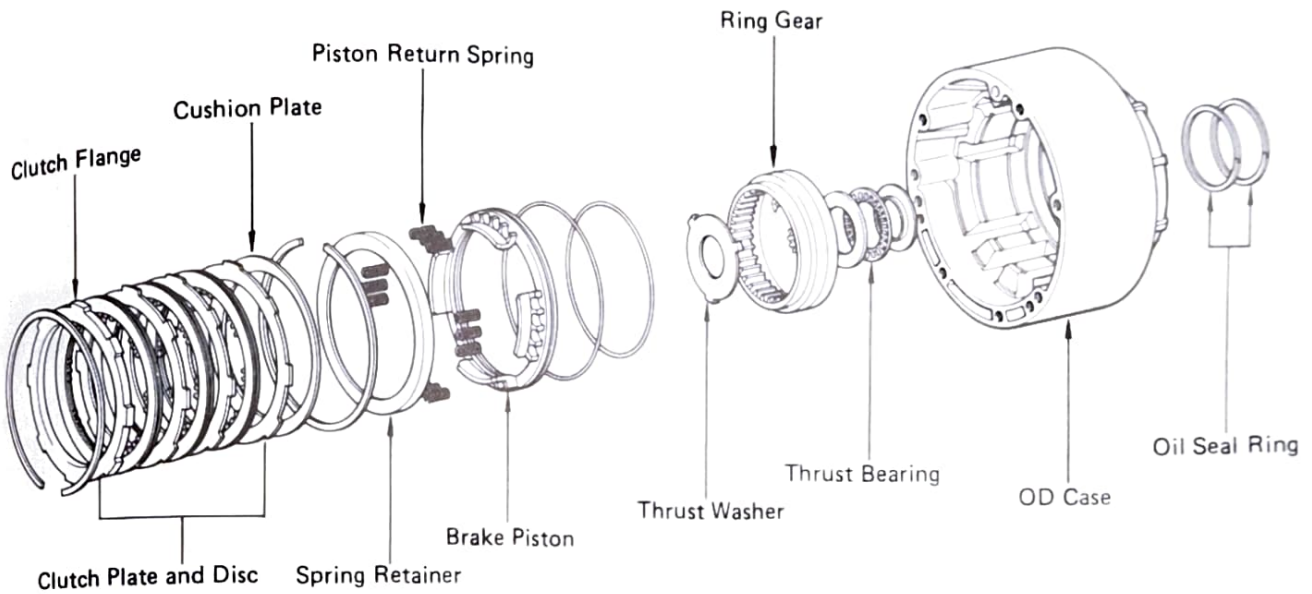
15. ASSEMBLE OD CLUTCH DRUM AND OD PLANETARY GEAR
    Mesh hub with disc, twisting and jiggling hub as required.



16. CHECK OPERATION OF ONE-WAY CLUTCH
    Hold clutch drum and turn input shaft. The input shaft should turn freely clockwise and should lock counterclockwise.
    If the one-way clutch does not work properly, replace it.

17. KEEP THRUST WASHER, RACE AND BEARING TOGETHER FOR ASSEMBLY
    The parts left over will be installed later, as the transmission is assembled.

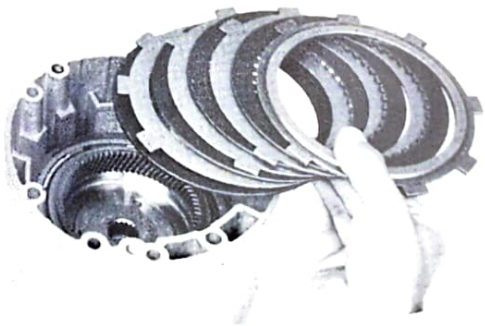
OD Case and Brake



DISASSEMBLY OF OD CASE AND BRAKE

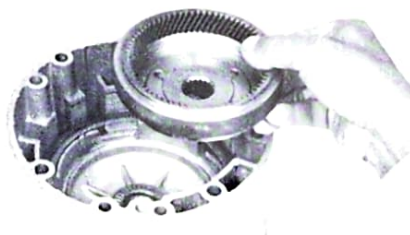
1. REMOVE OUTER SNAP RING FROM OD CASE

   Using a screwdriver, compress snap ring and lift out.



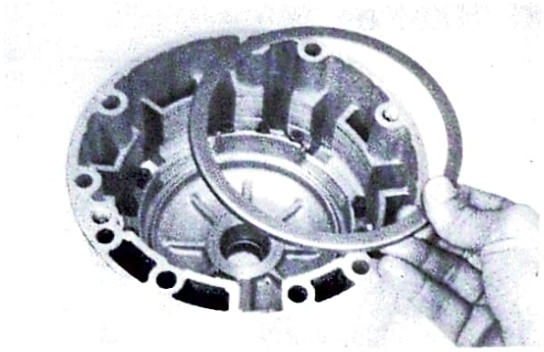
2. REMOVE CLUTCH FLANGE, DISCS, PLATES AND CUSHION PLATE

   Keep in order.



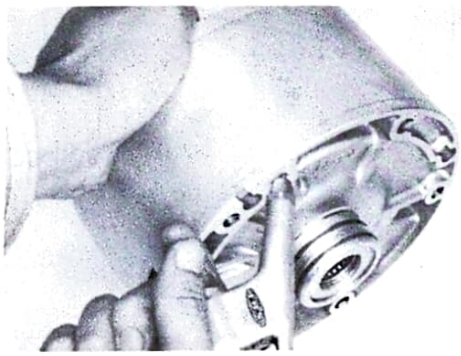
3. REMOVE RING GEAR, THRUST BEARING AND RACES

   Pull out the ring gear and then remove bearing and races. Note position of races.



4. REMOVE SNAP RING, SPRING RETAINER AND TWELVE RETURN SPRINGS

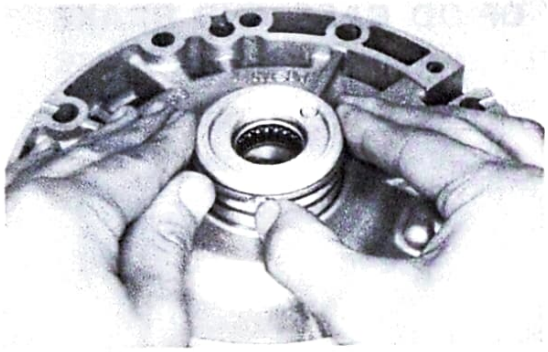
Using a screwdriver, compress snap ring and lift out. Remove retainer and springs.



5. REMOVE BRAKE PISTON

Blow compressed air through the case hole indicated in the figure to pop out the brake piston.

If piston does not pop out, lift it out with needle nose pliers.



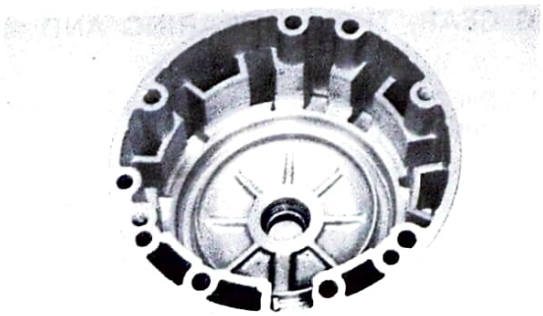
6. REMOVE TWO OIL SEAL RINGS FROM OD CASE

Unlock, spread and slide off by hand.

INSPECTION OF OD CASE AND BRAKE

1. THOROUGHLY CLEAN ALL PARTS – EXCEPT DISCS – IN SOLVENT

Use only fresh, clean solvent. Maintain order of parts during cleaning. Dry all parts with compressed air.



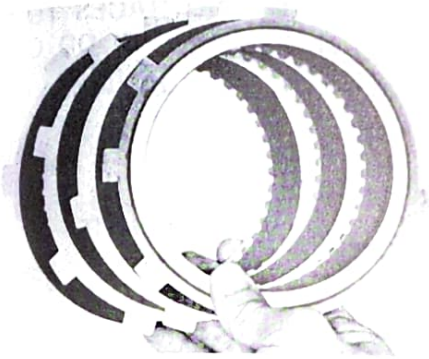
2. INSPECT OD CASE

Check piston sliding surface, snap ring grooves, oil seal rings and ring grooves for wear or damage.

3. INSPECT PISTON AND COMPRESSION SPRINGS

(a) Check piston contacting surface with case for wear or damage.

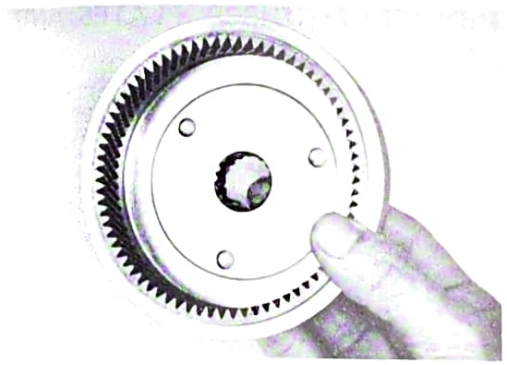
(b) Check compression springs for deterioration or damage.



4. INSPECT CUSHION PLATE, DISCS, PLATES AND FLANGE

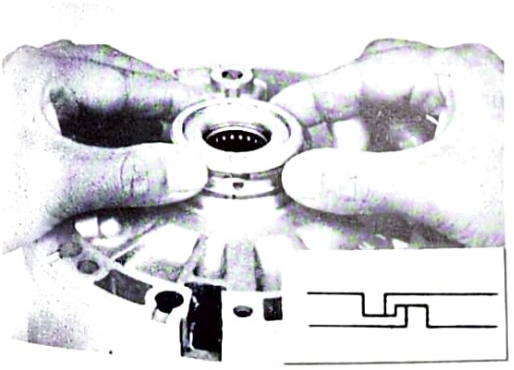
Check outer and inner lugs and sliding surfaces for wear or damage.

NOTE: Do not allow discs to dry out. Prepare new discs by soaking at least two hours in ATF.



5. INSPECT PLANETARY RING GEAR

Check gear teeth and splines for wear or damage.



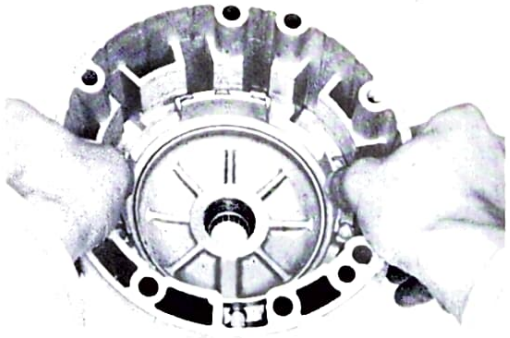
ASSEMBLY OF OD CASE AND BRAKE (See illustration on page 10-49)

GENERAL ASSEMBLY NOTE:

Coat all friction surfaces, sliding surfaces, thrust washers and O-rings with ATF during assembly.

1. INSTALL TWO OIL SEAL RINGS ON OD CASE

Spread apart and slip into groove. Lock into place.

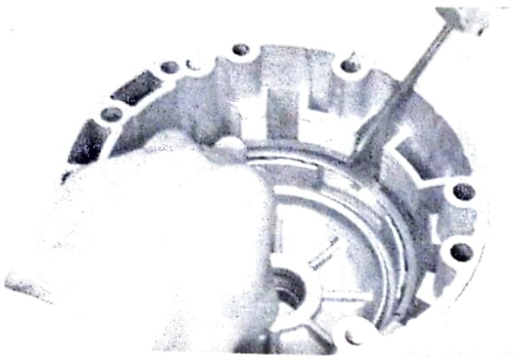


2. INSTALL NEW O-RINGS ON PISTON

Install by hand. Coat O-rings with ATF.

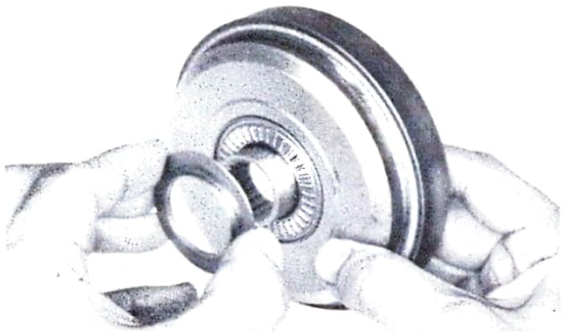
3. INSTALL BRAKE PISTON INTO OD CASE

Install piston with cup side up being careful not to damage O-rings.



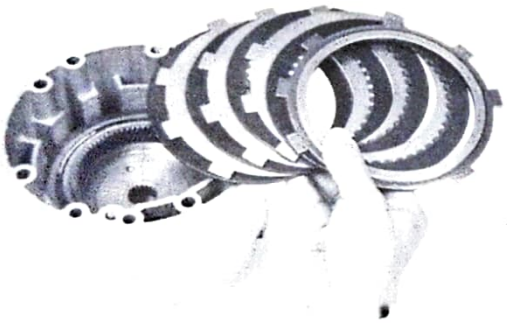
4. **INSTALL TWELVE RETURN SPRINGS AND SET RETAINER AND SNAP RING IN PLACE**

NOTE: Make sure that the snap ring is installed fully in groove.



5. **INSTALL THRUST BEARING AND RACES TO RING GEAR AND SET RING GEAR IN OD CASE**

NOTE: Make sure that the races are installed in correct direction.

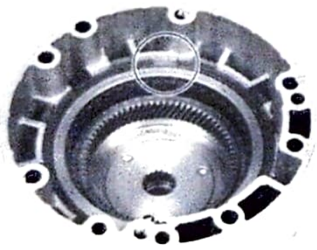


6. **INSTALL CUSHION PLATE, DISCS, PLATES AND FLANGE**

Using low-pressure compressed air, blow all excess ATF from discs.

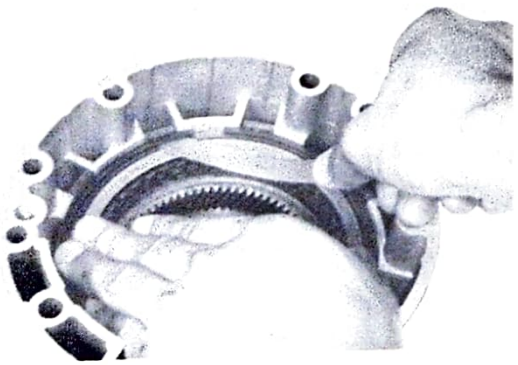
CAUTION: High-pressure air will damage discs.

Install in order: Cushion plate (rounded end down) -plate-disc-plate-disc-plate-disc-flange (flat end down)



7. **INSTALL SNAP RING**

Check that the ends of the snap ring are not aligned with one of the cutouts.



8. **MEASURE BREAK CLEARANCE**

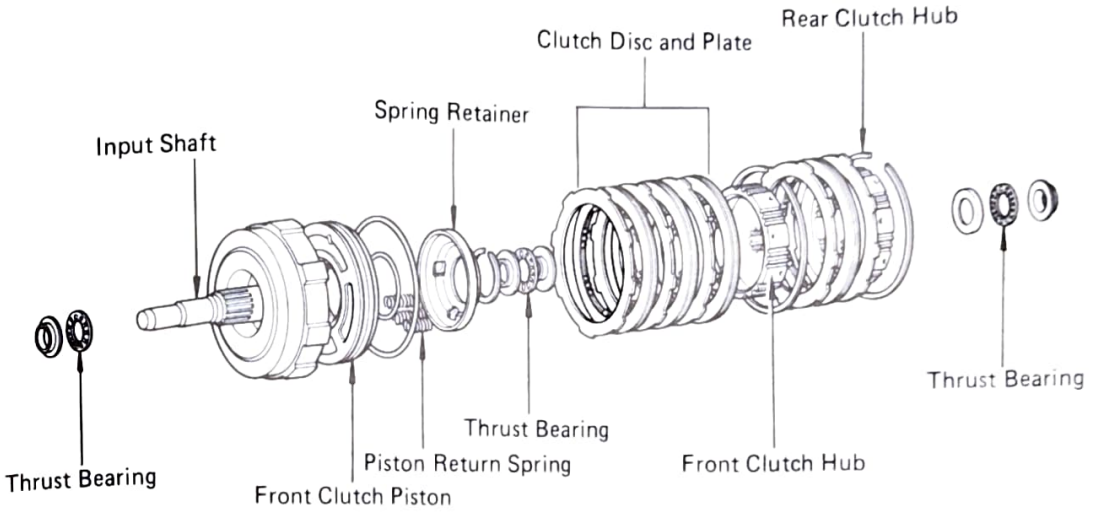
Measure the distance between snap ring and flange.

Standard clearance: 0.35 – 1.60 mm (0.0138 – 0.0630 in.)
Maximum clearance: 2.1 mm (0.083 in.)

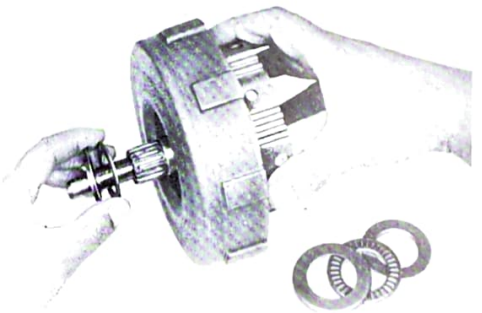
9. **KEEP THRUST WASHER FOR ASSEMBLY**

The thrust washer left over will be installed later, as the transmission is assembled.

Front Clutch

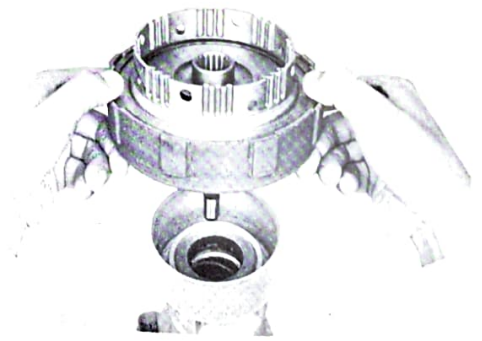


DISASSEMBLY OF FRONT CLUTCH



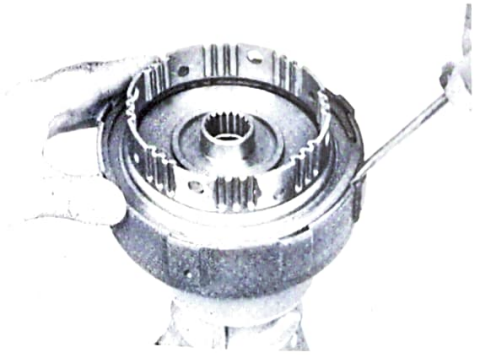
1. REMOVE THRUST BEARINGS AND RACES FROM BOTH SIDES OF CLUTCH

   Note position of races.



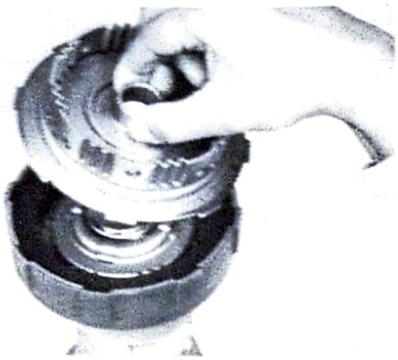
2. USE EXTENSION HOUSING AS A WORK STAND

   Insert the input shaft into the extension housing.



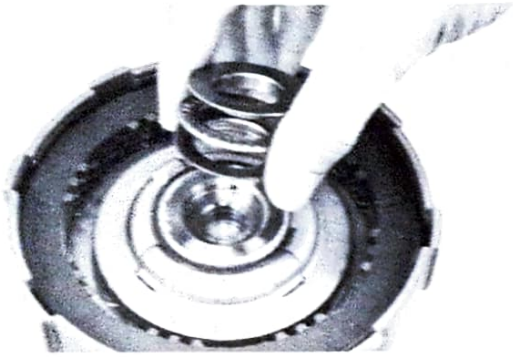
3. REMOVE SNAP RING FROM FRONT CLUTCH DRUM

   Using a screwdriver, compress the snap ring and lift out.



4. **REMOVE FRONT CLUTCH HUB**

Lift out two clutch hubs together.

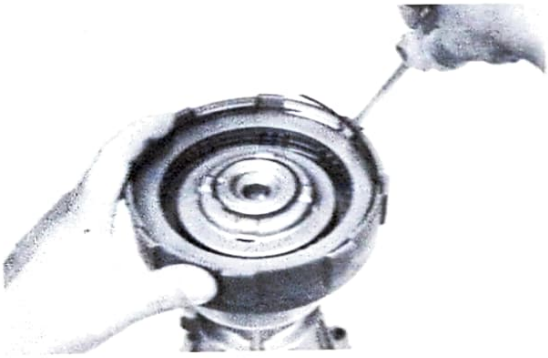


5. **REMOVE THRUST BEARINGS AND RACES**

Note position of races for assembly.

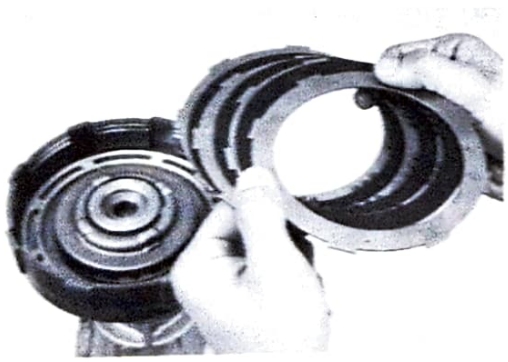
6. **REMOVE CLUTCH DISC**

Lift out a disc.



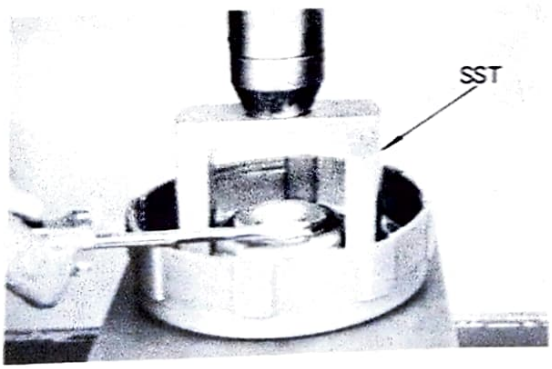
7. **REMOVE THIN SNAP RING**

Compress with a screwdriver and lift up.



8. **REMOVE REMAINING CLUTCH PLATES AND DISCS**

Lift out four plates and three discs. Keep them in order.



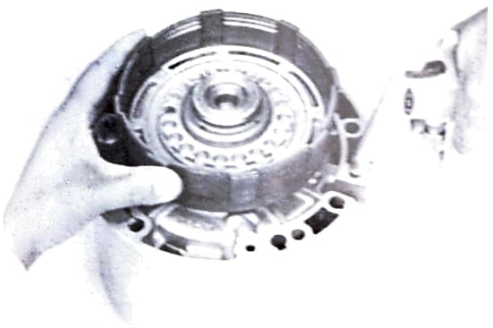
9. **COMPRESS RETURN SPRINGS AND REMOVE SNAP RING**

(a) Place spring compressor* on the spring retainer, and compress springs on the shop press.

*SST 09350-20013 or 00002-00223-04

(b) Using snap ring pliers, spread snap ring and lift from front clutch. Carefully remove SST.

10. REMOVE SPRING RETAINER AND SPRINGS



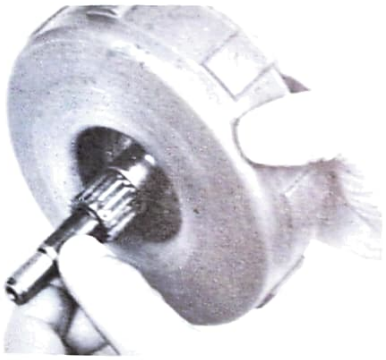
11. ASSEMBLE FRONT CLUTCH ON OD CASE AND BLOW OUT PISTON

(a) Slide front clutch onto OD case.

(b) Apply compressed air to OD case to remove piston. If piston does not come out completely, use pliers to remove it.

(c) Remove front clutch from OD case.

INSPECTION OF FRONT CLUTCH



1. THOROUGHLY WASH ALL PARTS – EXCEPT DISCS – IN SOLVENT

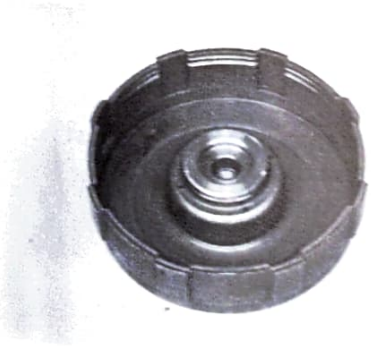
Use fresh, clean solvent. Maintain order of parts during cleaning. Dry all parts with compressed air.

2. INSPECT INPUT SHAFT

(a) Check thrust bearing surface, bushing surface and seal surface for wear, burning or damage.

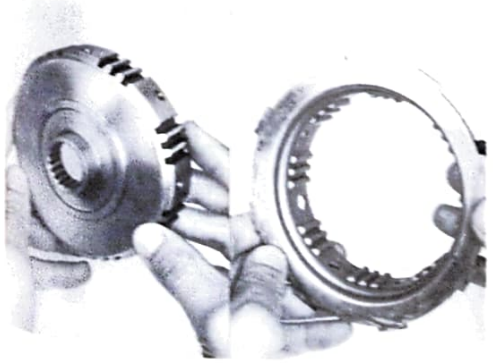
(b) Check shaft and housing for cracks or damage.

(c) Check splines for wear, groove or chipped teeth.



3. INSPECT FRONT CLUTCH DRUM

Check lug surfaces, piston sliding surface, thrust bearing surface and snap ring groove for wear, cracks, burning or other damage.

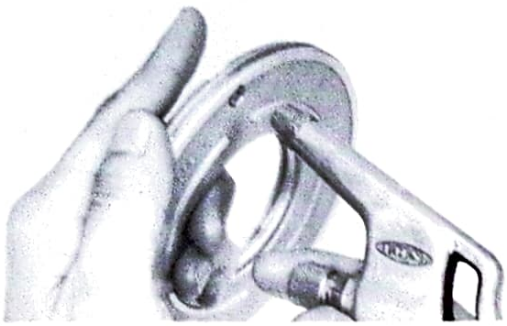


4. INSPECT FRONT CLUTCH HUB

Check splines, lug surfaces and hub thrust surface for wear, burning, cracks or damage.

5. INSPECT REAR CLUTCH HUB

Check lugs and mating surfaces for wear or damage.



6. **INSPECT PISTON**
   (a) Check sliding surfaces and O-ring grooves for wear or damage.
   (b) Shake piston to make sure check ball is free, and check that valve does not leak by applying low-pressure air.

7. **INSPECT PISTON RETURN SPRINGS AND RETAINER**
   Check for equal height and for broken springs.
   Check retainer for wear or damage.

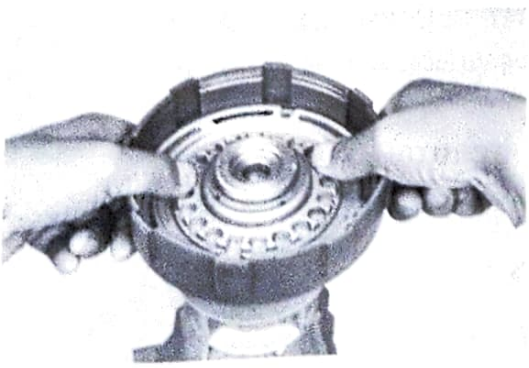
8. **INSPECT DISCS AND PLATES**
   (a) Check outer and inner lugs for wear.
   (b) Check surfaces for burning, scoring and debonding.
   (c) Check for warpage (discs and plates should be flat).
   (d) Measure discs. Minimum allowable thickness is 2.1 mm (0.083 in.).
   (e) Replace all worn and damaged parts.

   NOTE: Do not allow discs to dry out. Prepare new discs by soaking at least two hours in ATF.

ASSEMBLY OF FRONT CLUTCH
(See illustration on page 10-53)

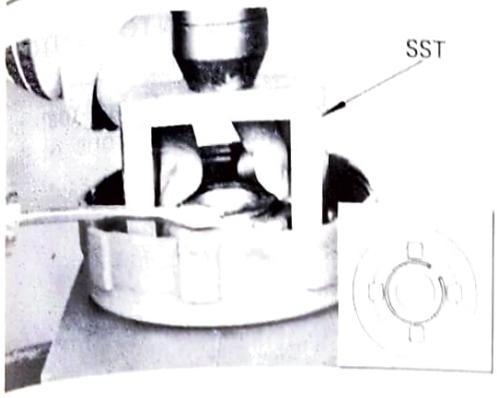
GENERAL ASSEMBLY NOTE:

Coat all friction surfaces, sliding surfaces, thrust surfaces and O-rings with ATF during assembly.



1. **INSTALL NEW O-RINGS ON PISTON**
   Install by hand. Coat O-rings with ATF.

2. **INSTALL PISTON IN FRONT CLUTCH DRUM**
   Press into housing with cup side up (check ball down). Be careful not to damage O-rings.



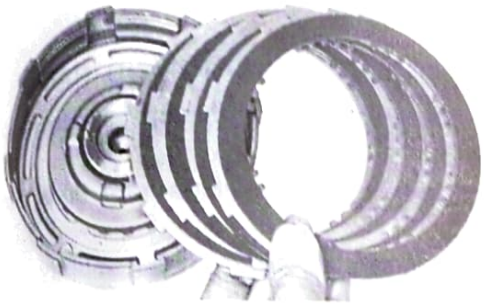
3. INSTALL RETURN SPRINGS, SPRING RETAINER AND SNAP RING IN PLACE

4. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

(a) Put spring compressor* on the retainer, and compress springs on the shop press.

*SST 09350-20013 or 00002-00223-04

(b) Spread with snap ring pliers and install in groove. Remove SST.



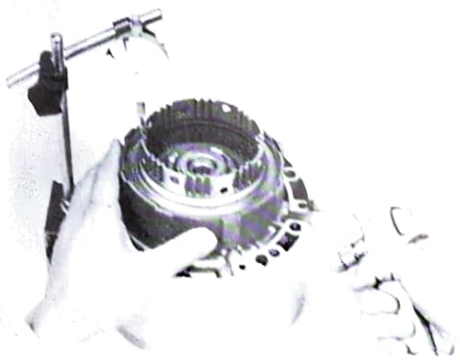
5. INSTALL DISCS AND PLATES

Using low-pressure compressed air, blow all excess ATF from discs. For measurement of the clutch pack, install all four plates and four discs (temporarily without small snap ring):

Install in order: Plate-disc-plate-disc-plate-disc-plate (no snap ring)-disc.

6. INSTALL REAR CLUTCH HUB AND OUTER SNAP RING

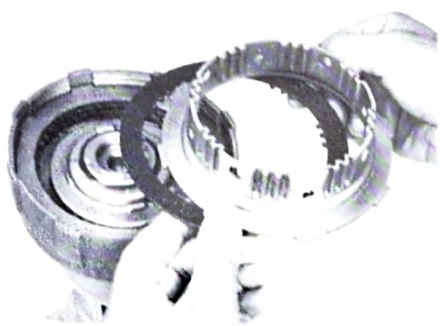
Check that the ends of snap ring are not aligned with one of the cutouts.



7. CHECK PISTON STROKE OF FRONT CLUTCH

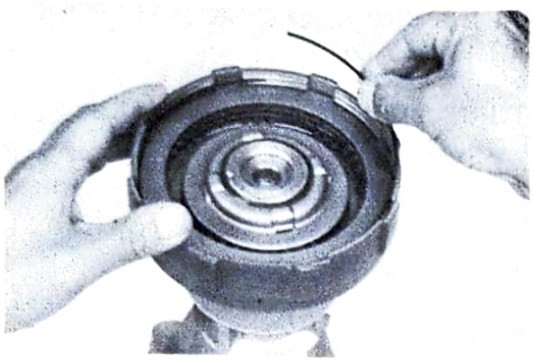
Install front clutch drum onto the oil pump body. With a dial indicator, apply 4 – 8 kg/cm² (57 – 114 psi) of compressed air and measure the stroke as shown.

Stroke: 1.84 – 2.86 mm (0.0724 – 0.1126 in.)



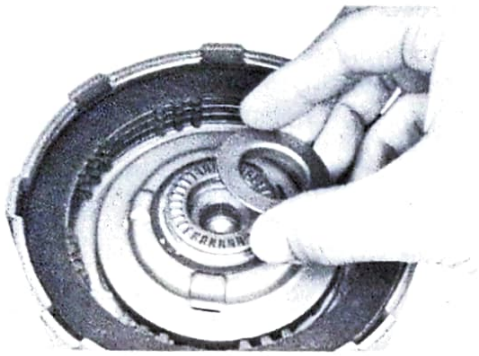
8. REMOVE SNAP RING, REAR CLUTCH HUB AND ONE DISC TO ALLOW INSTALLATION OF INNER SNAP RING

Compress outer snap ring with screwdriver. Lift off parts.



9. **INSTALL THIN INNER SNAP RING INTO CLUTCH DRUM**

Compress and lower into groove by hand. Check that the ends of the snap ring are not aligned with one of the cutouts.



10. **INSTALL DISC**

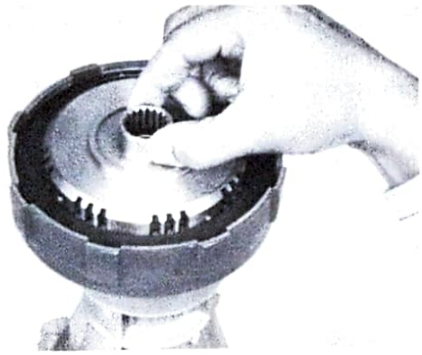
Install a disc on the snap ring.

11. **INSTALL INNER THRUST BEARING AND RACES**

IMPORTANT: Coat parts with petroleum jelly to keep them in place.

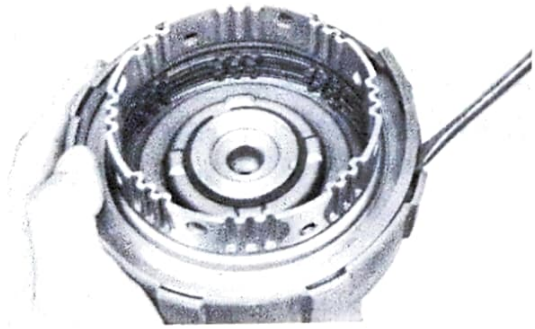
Install inner race, needle bearing and outer race. Press into place.

NOTE: Face the lip of race toward front clutch body.



12. **INSTALL FRONT CLUTCH HUB**

Align disc lugs with hub teeth. Make sure hub meshes with all discs and is fully inserted.



13. **INSTALL REAR CLUTCH HUB AND OUTER SNAP RING**

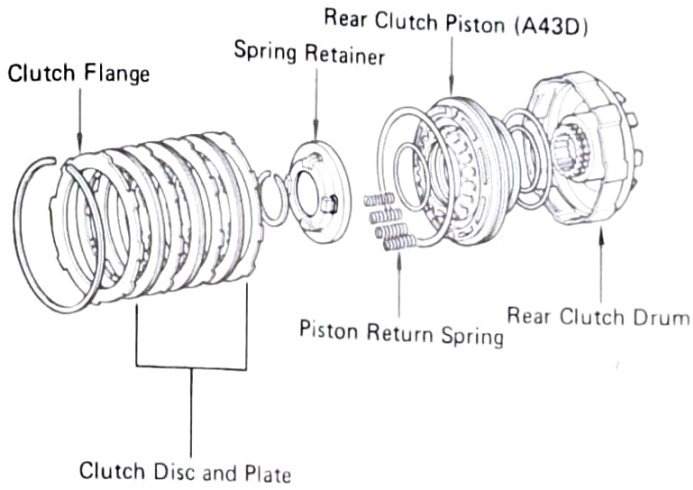
Check that the ends of the snap ring are not aligned with one of the cutouts.

NOTE: Note position of thrust bearing and races and keep them together until assembly.

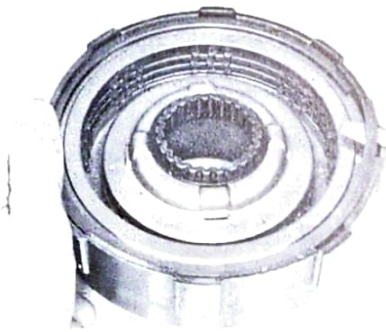
14. **KEEP THRUST BEARINGS AND RACES TOGETHER FOR ASSEMBLY**

The parts left over will be installed later, as the transmission is assembled.

Rear Clutch



DISASSEMBLY OF REAR CLUTCH

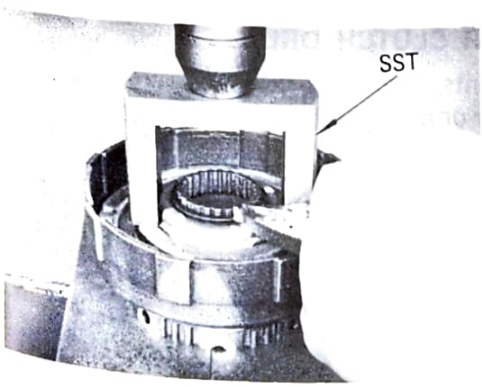


1. REMOVE OUTER SNAP RING FROM DRUM

   Using a screwdriver, compress snap ring and lift out.

2. REMOVE CLUTCH FLANGE, DISCS AND PLATES

   Keep in order.



3. **COMPRESS RETURN SPRINGS AND REMOVE SNAP RING**

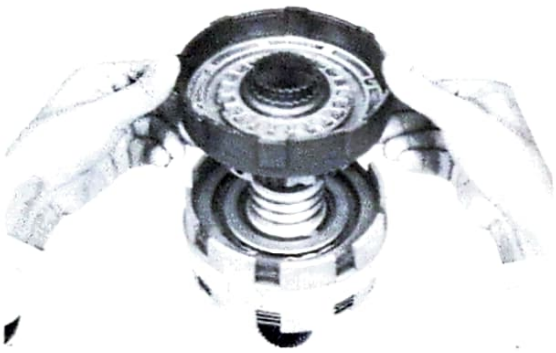
   (a) Place spring compressor* on the spring retainer, and compress springs in a standard shop press.

   *SST 09350-20013 or 00002-00223-04

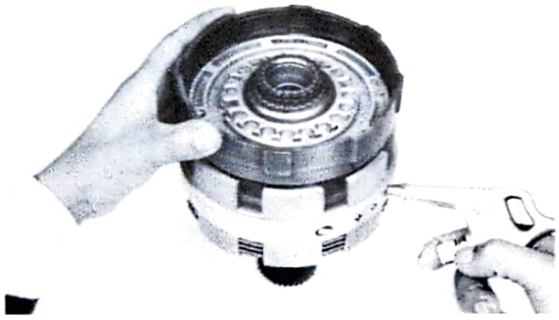
   (b) Using snap ring pliers, spread snap ring and lift from rear clutch. Remove SST.

4. REMOVE SPRING RETAINER, SNAP RING AND EIGHTEEN RETURN SPRINGS

Lift off by hand.



5. SET REAR CLUTCH ON CENTER SUPPORT



6. REMOVE REAR CLUTCH PISTON

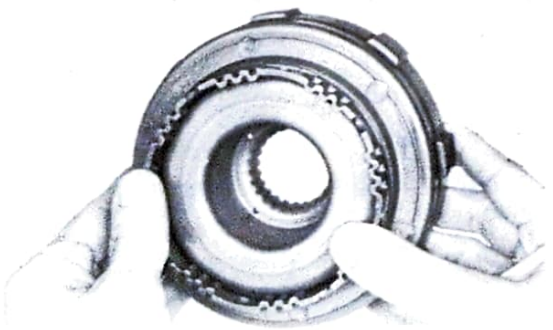
Blow out piston with compressed air.

7. REMOVE REAR CLUTCH HUB

INSPECTION OF REAR CLUTCH

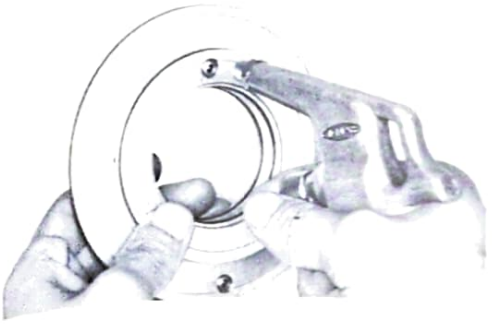
1. THOROUGHLY WASH ALL PARTS – EXCEPT DISCS – IN SOLVENT

Use only fresh, clean solvent. Maintain order of parts during cleaning. Dry all parts with compressed air.



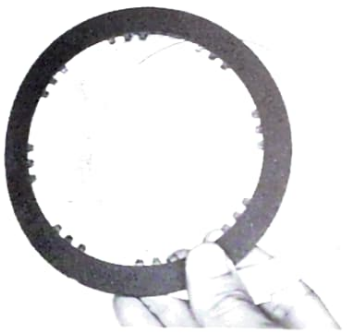
2. INSPECT REAR CLUTCH DRUM

Check lug detents, piston sliding surfaces and snap ring grooves for wear or damage.



3. INSPECT REAR CLUTCH PISTON
   (a) Check sliding surfaces and O-ring grooves for wear or damage.
   (b) Check that check ball is free by shaking each piston.
   (c) Check that valve does not leak by applying low-pressure compressed air.

4. INSPECT PISTON RETURN SPRINGS
   Check for equal height and for broken springs.
   Check retainer for wear or damage.



5. INSPECT DISCS, PLATES AND FLANGE
   (a) Check outer and inner lugs for wear.
   (b) Check surfaces for burning (black appearance), scoring or debonding.
   (c) Check for warpage.
   (d) Measure disc. Minimum allowable thickness is 2.1 mm (0.083 in.).
   (e) Replace all worn or damaged parts.

   NOTE: Do not allow discs to dry out. Prepare new discs by soaking at least two hours in ATF.

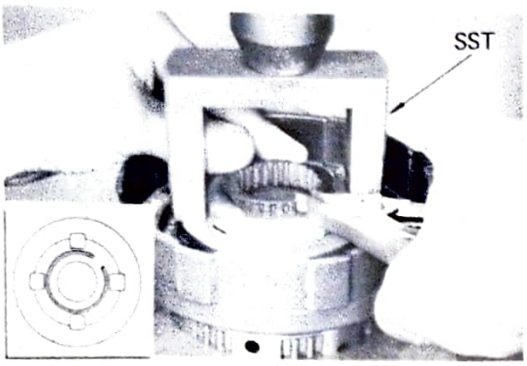
ASSEMBLY OF REAR CLUTCH
(See illustration on page 10-59)

GENERAL ASSEMBLY NOTE:

Coat all friction surfaces, sliding surfaces and O-rings with ATF during assembly.

1. INSTALL NEW O-RINGS ON PISTON
   Coat with ATF.

2. INSTALL REAR CLUTCH PISTON IN DRUM
   Press rear clutch piston into drum with cup side up, being careful not to damage O-rings.



3. INSTALL RETURN SPRINGS, RETAINER AND SNAP RING

(a) Put the return springs, retainer and snap ring in place.

(b) Put spring comprssor* in place, and compress springs on shop press.

*SST 09350-20013 or 00002-00223-04

(c) Spread ring with snap ring pliers. Remove SST.

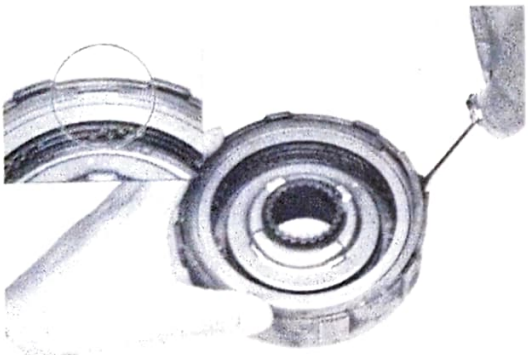
4. INSTALL DISCS, PLATES AND FLANGE

Using low-pressure compressed air, blow all excess ATF from discs.

CAUTION: **High-pressure air will damage discs.**

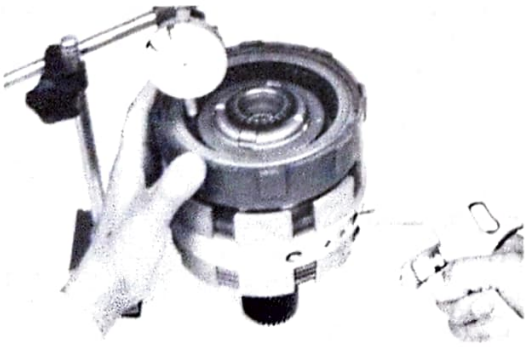
Install in order: Plate-disc-plate-disc-plate-disc-flange.

NOTE: Be sure to install the flange facing flat side toward disc.



5. INSTALL SNAP RING

Check that the ends of the snap ring are not aligned with one of the cutouts.



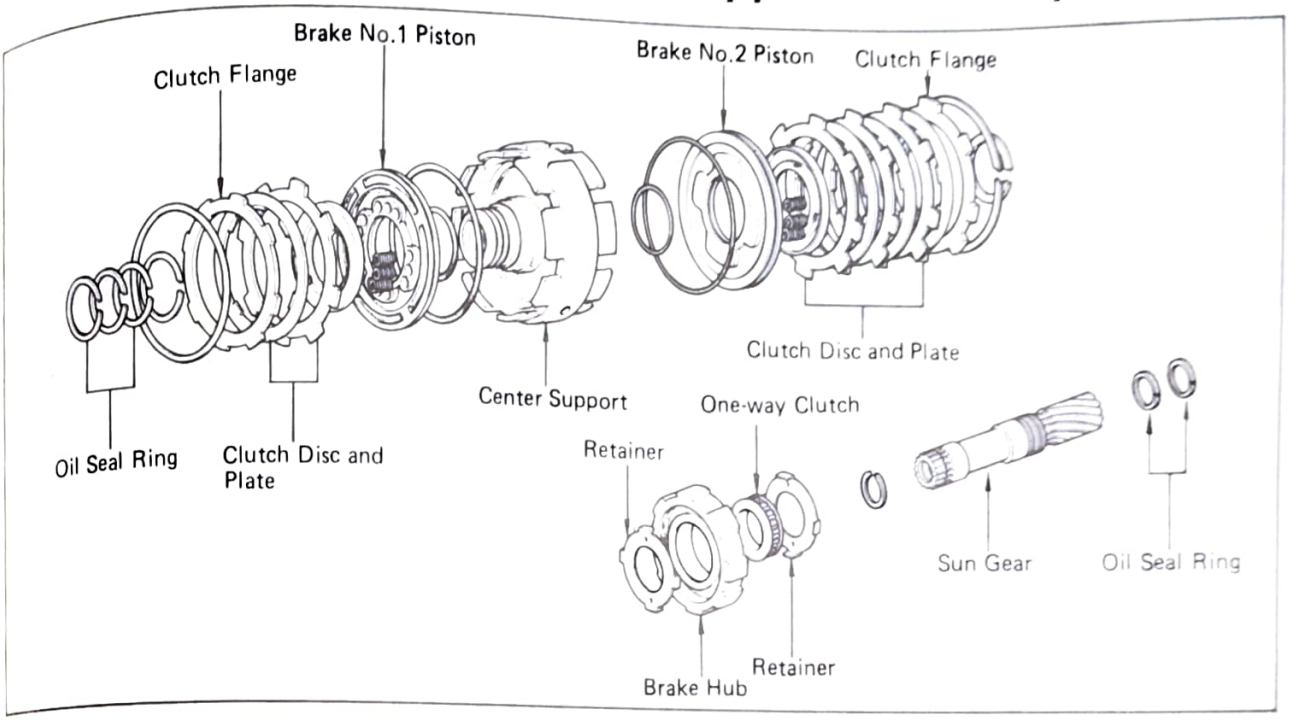
6. CHECK PISTON STROKE OF REAR CLUTCH

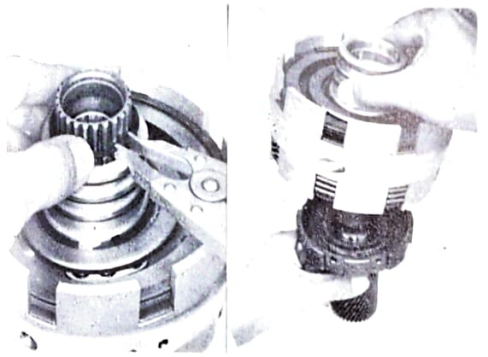
Install rear clutch onto the center support. With a dial indicator, apply 4 – 8 kg/cm² (57 – 114 psi) of compressed air and measure the stroke as shown.

Stroke: 1.24 – 2.12 mm (0.0488 – 0.0835 in.)

NOTE: Keep thrust bearing and race together until assembly.

Center Support Assembly



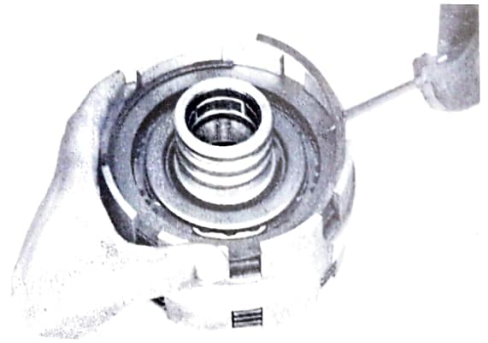


DISASSEMBLY OF CENTER SUPPORT ASSEMBLY

1. REMOVE SNAP RING FROM END OF SUN GEAR SHAFT

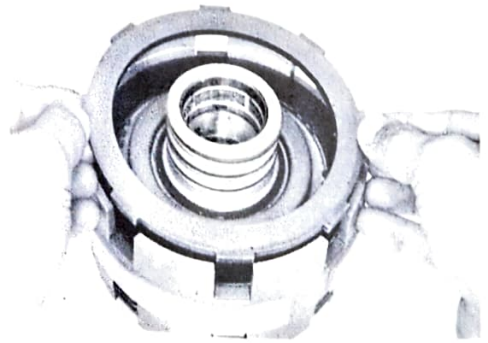
   Spread with snap ring pliers and lift off.

2. PULL CENTER SUPPORT ASSEMBLY FROM SHAFT



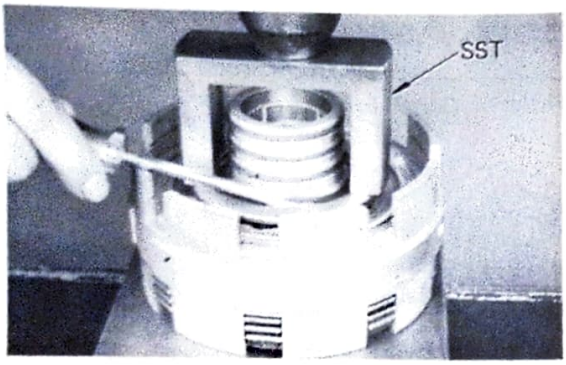
3. REMOVE SNAP RING FROM FRONT OF CENTER SUPPORT ASSEMBLY (BRAKE NO.1)

   Using a screwdriver, compress the snap ring and lift out.



4. REMOVE CLUTCH FLANGE, DISC AND PLATE (BRAKE NO.1)

   Lift out by hand.

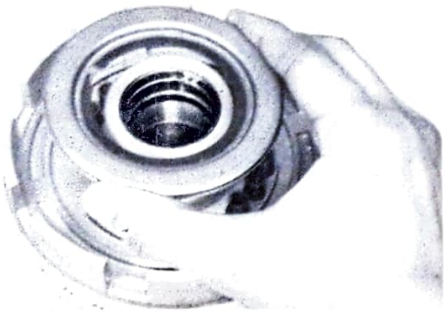


5. **COMPRESS PISTON RETURN SPRINGS AND REMOVE SNAP RING**

(a) Place spring compressor* on spring retainer and compress springs with a standard shop press. Using a screwdriver, remove snap ring.

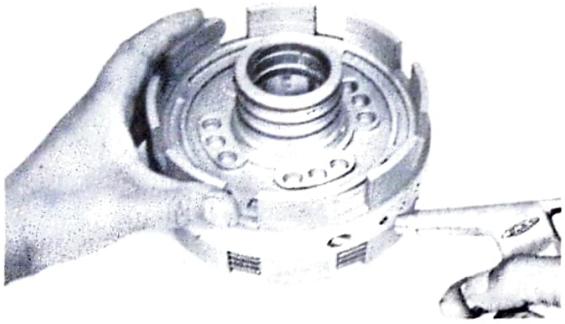
(b) Carefully remove SST.

*SST 09350-20013 or 00002-00223-04



6. **REMOVE SNAP RING, SPRING RETAINER AND TWELVE SPRINGS**

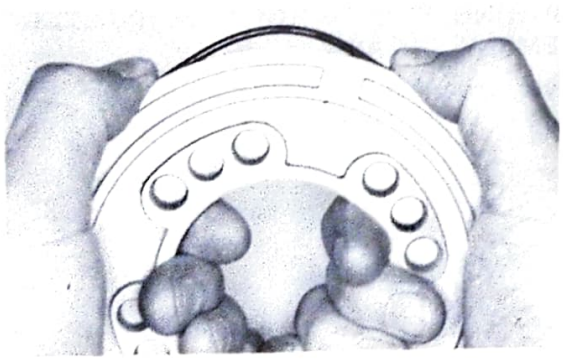
Lift off by hand.



7. **REMOVE BRAKE NO.1 PISTON**

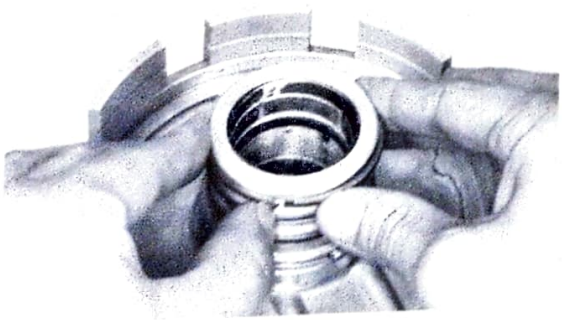
Blow compressed air through the center support oil hole to remove brake No. 1 piston.

If piston does not pop out, lift out with needle nose pliers.



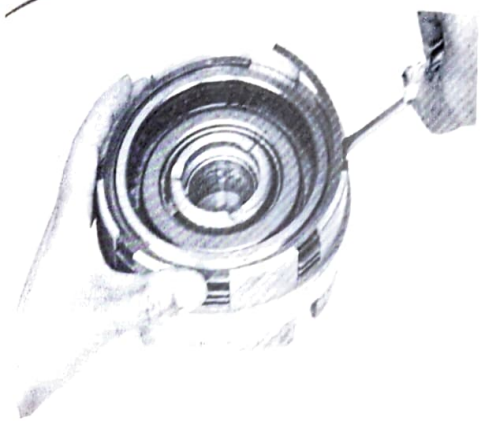
8. **REMOVE BRAKE NO.1 PISTON O-RINGS**

Remove both inner and outer O-rings by hand. Discard O-rings.



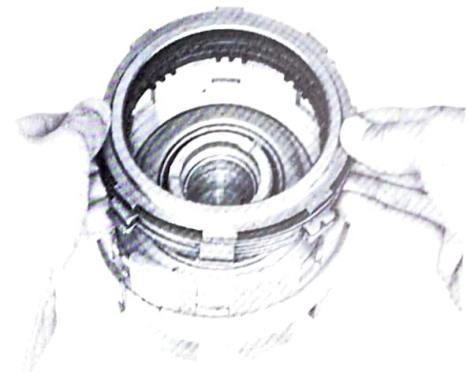
9. **REMOVE THREE OIL SEAL RINGS FROM CENTER SUPPORT**

Unlock, spread and slide off by hand.



10. TURN CENTER SUPPORT ASSEMBLY OVER AND REMOVE REAR SNAP RING (BRAKE NO.2)

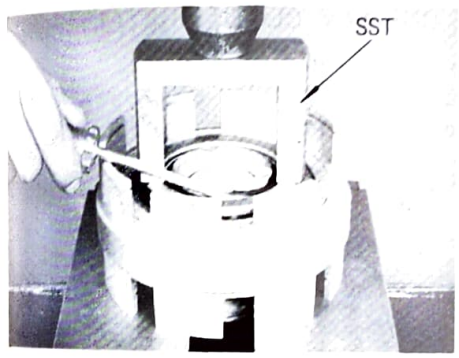
Using a screwdriver, compress the snap ring and lift out.



11. REMOVE CLUTCH FLANGE (BRAKE NO.2)

12. REMOVE DISCS AND PLATES

Keep in order.

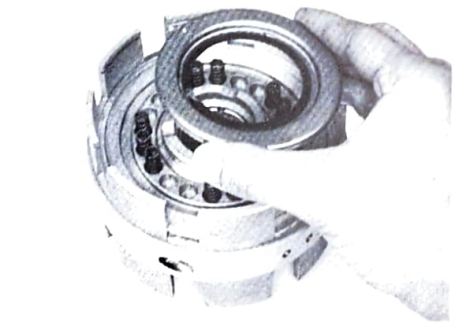


13. COMPRESS PISTON RETURN SPRINGS AND REMOVE SNAP RING

(a) Place spring compressor* on spring retainer and compress springs with a standard shop press. Using a screwdriver, remove snap ring.

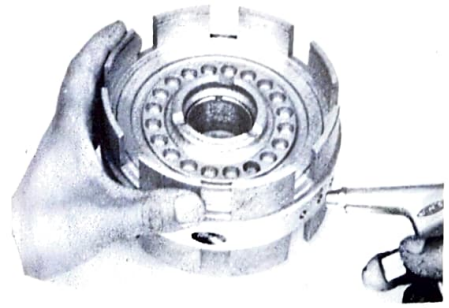
(b) Carefully remove SST.

*SST 09350-20013 or 00002-00223-04



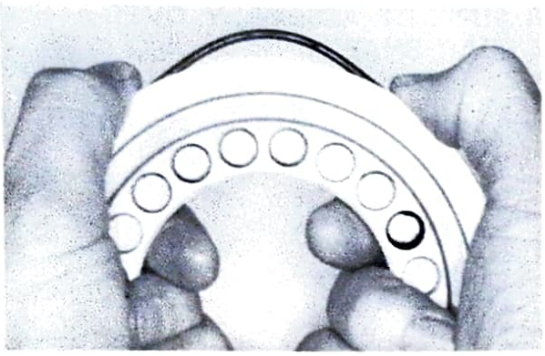
14. REMOVE SNAP RING, SPRING RETAINER AND TWELVE SPRINGS

Lift off by hand.



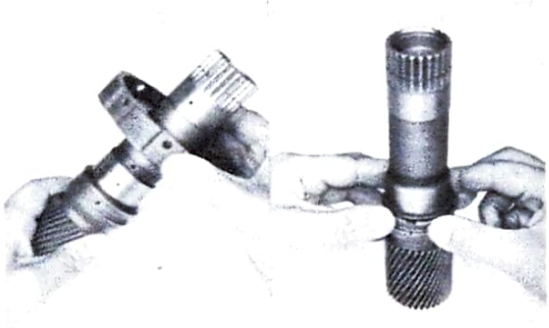
15. REMOVE BRAKE NO.2 PISTON

Blow compressed air through the center support oil hole to remove brake No. 2 piston.

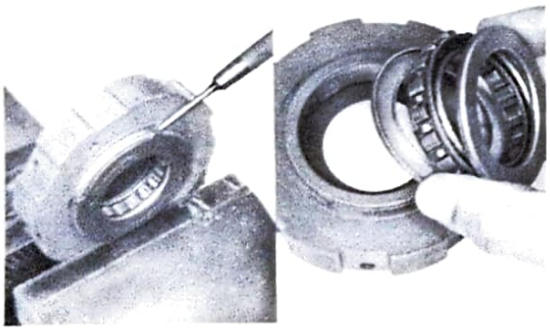


16. **REMOVE NO.2 PISTON O-RINGS**

Remove both inner and outer O-rings by hand. Discard O-rings.



17. **REMOVE ONE-WAY CLUTCH ASSEMBLY AND OIL SEAL RINGS FROM SUN GEAR**



18. **REMOVE ONE ONE-WAY CLUTCH RETAINER**

Hold the clutch assembly in a soft-jaw vise. Bend several tabs back with a tapered punch. Pry off the retainer with a screwdriver. Leave other retainer on the hub.

19. **REMOVE ONE-WAY CLUTCH AND RETAINERS**

Lift off one-way clutch and retainers from brake hub.

INSPECTION OF CENTER SUPPORT ASSEMBLY

1. **THOROUGHLY CLEAN ALL PARTS – EXCEPT DISCS – IN SOLVENT**

Use only fresh, clean solvent. Maintain order of parts during cleaning. Dry all parts with compressed air.

2. **INSPECT ONE-WAY CLUTCH**

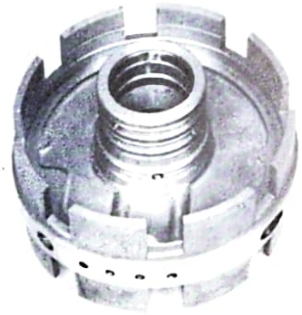
Check sprag, ribbon springs and end bearings for wear or damage.

3. **INSPECT BRAKE NO.2 HUB**

Check bore and lugs for wear or damage.

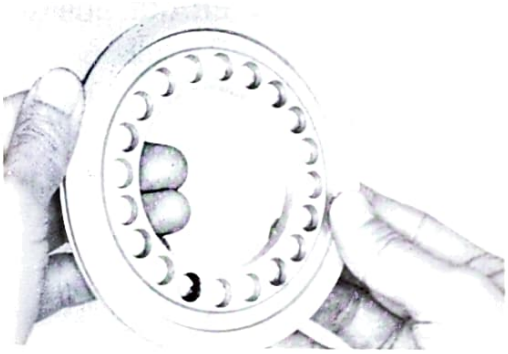
4. INSPECT SUN GEAR AND OIL SEAL RINGS

Check gear teeth, splines, one-way clutch inner race, oil seal grooves and oil seals for wear, chipping or damage.



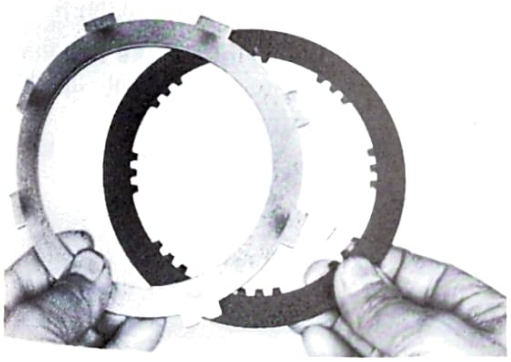
5. INSPECT CENTER SUPPORT

Check oil seal grooves, oil seals, bushing surface, clutch plate slots and snap ring grooves for wear, ridges or damage.



6. INSPECT BRAKE PISTONS

Check O-ring grooves and contacting surfaces for wear, ridges, cracks or damage.



7. INSPECT DISCS AND PLATES

(a) Check outer and inner lugs for wear.

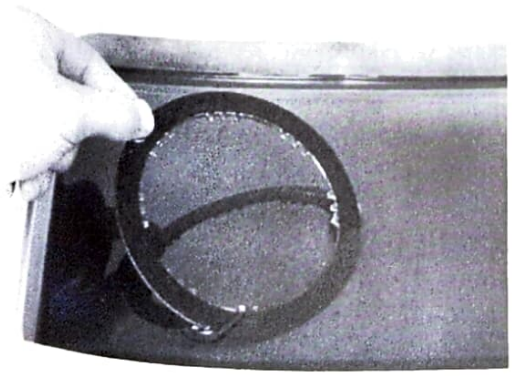
(b) Check surfaces for burning (black appearance).

(c) Check disc friction surfaces for scoring, flacking and debonding.

(d) Check for warpage (discs and plates should be flat).

(e) Measure thickness of each disc. Minimum allowable thickness is 2.1 mm (0.083 in.).

(f) Replace any damaged or worn discs or plates.



8. DO NOT ALLOW DISCS TO DRY OUT, SOAK NEW DISCS IN ATF

Keep discs being reused from drying out; if necessary, immerse in ATF. Prepare new discs by soaking at least two hours in ATF.

9. INSPECT RETURN SPRINGS

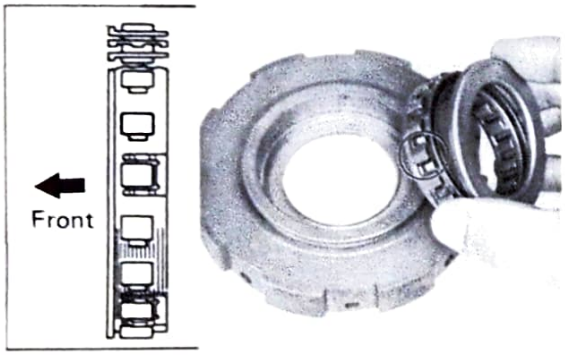
Check for equal height and for broken springs.

Check retainer for wear or damage.

ASSEMBLY OF CENTER SUPPORT ASSEMBLY (See illustration on page 10-63)

GENERAL ASSEMBLY NOTE:

Coat all friction surfaces, bearing races, sliding surfaces and O-rings with ATF during assembly.

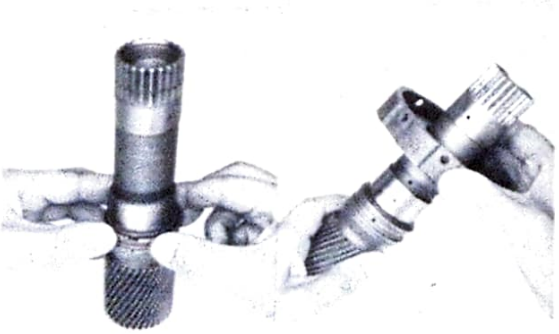


1. INSTALL ONE-WAY CLUTCH IN BRAKE HUB

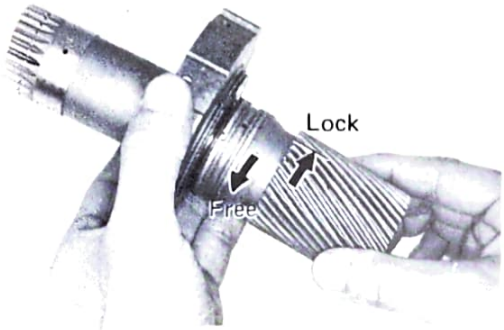
Install one-way clutch into the brake hub facing the spring cage toward front.

2. INSTALL NEW ONE-WAY CLUTCH RETAINER

Push retainer onto the brake hub. Hold brake hub in vise with soft jaws, and flatten ears with a chisel. Check to make sure that the retainer is centered.



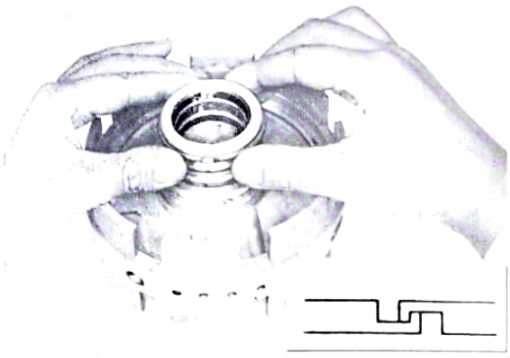
3. INSTALL TWO OIL SEAL RINGS AND ONE-WAY CLUTCH ASSEMBLY ON SUN GEAR



4. CHECK OPERATION OF ONE-WAY CLUTCH

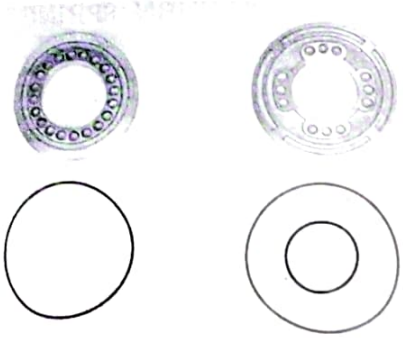
Hold the brake No. 2 hub and turn the sun gear. The sun gear should turn freely counterclockwise and should lock clockwise.

If the one-way clutch does not work properly, replace it.



5. INSTALL THREE OIL SEAL RINGS ON CENTER SUPPORT

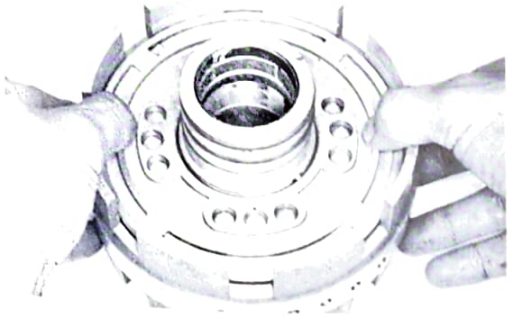
Spread apart and slip into groove. Hook both ends by hand.



6. INSTALL NEW O-RINGS ON PISTONS

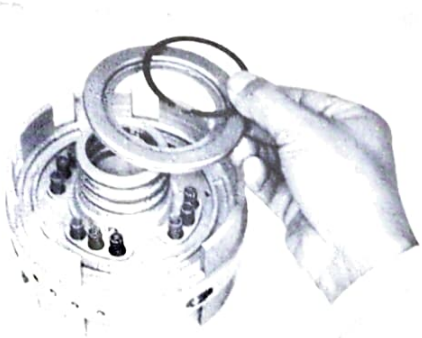
Install new inner and outer O-rings on two pistons.

NOTE: The inner O-ring is not installed on brake No. 2 piston.

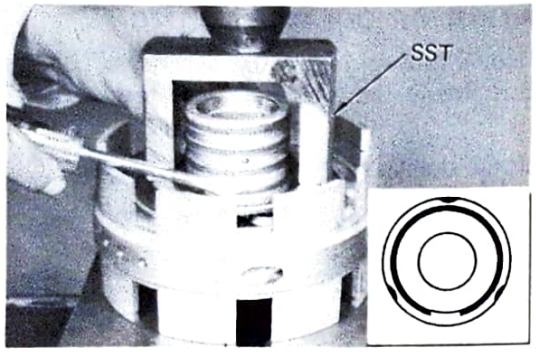


7. INSTALL PISTON NO.1 IN CENTER SUPPORT

Lubricate O-rings with ATF and push No.1 piston into oil seal ring side of center support. Press from side to side to work into place.



8. INSTALL TWELVE PISTON RETURN SPRINGS AND SET RETAINER WITH SNAP RING IN PLACE

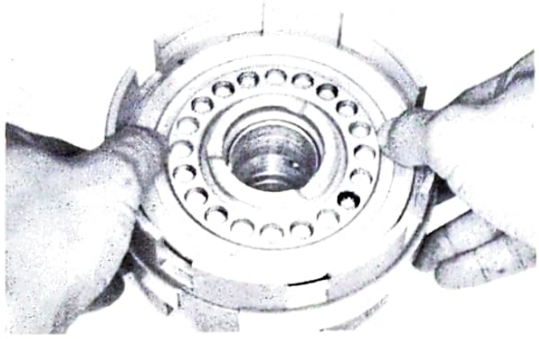


9. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

(a) Place spring compressor* on top of the retainer, and compress springs on shop press.

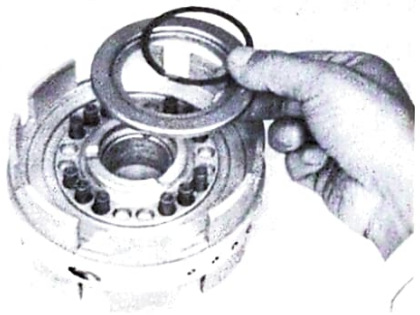
*SST 09350-20013 or 00002-00223-04

(b) Install snap ring using a screwdriver. Remove SST.

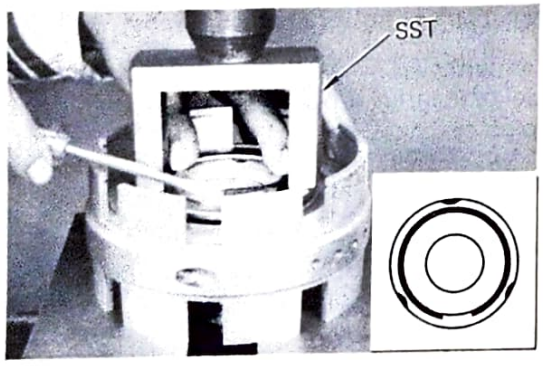


10. TURN CENTER SUPPORT OVER AND INSTALL BRAKE PISTON NO. 2

Lubricate O-rings with ATF and push No. 2 piston into place. When fully seated, the piston will be below the notch.



11. INSTALL TWELVE PISTON RETURN SPRINGS AND SET RETAINER WITH SNAP RING IN PLACE

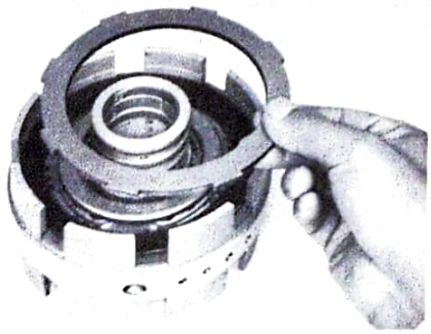


12. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

(a) Place spring compressor* on top of the retainer, and compress springs on shop press.

*SST 09350-20013 or 00002-00223-04

(b) Install snap ring using a screwdriver. Remove SST.

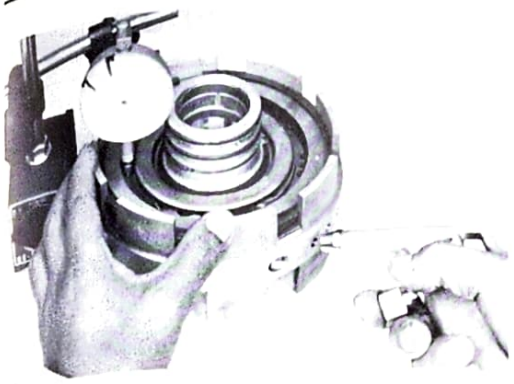


13. TURN CENTER SUPPORT OVER AND INSTALL BRAKE NO. 1 PLATE AND DISC

Install one plate first, and then one disc.

14. INSTALL CLUTCH FLANGE

Install with rounded edge toward disc.



15. INSTALL SNAP RING IN CENTER SUPPORT

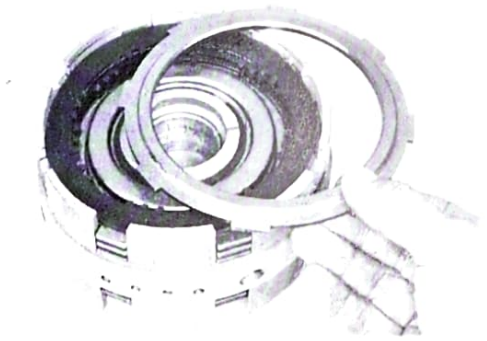
CAUTION: **Make sure that the ends of the snap ring are not aligned with one of the cutouts.**

Compress snap ring and push it into groove. Check that ring is completely seated in groove.

16. CHECK PISTON STROKE OF BRAKE NO.1

With a dial indicator, apply 4 – 8 kg/cm² (57 – 114 psi) of compressed air and measure the stroke as shown.

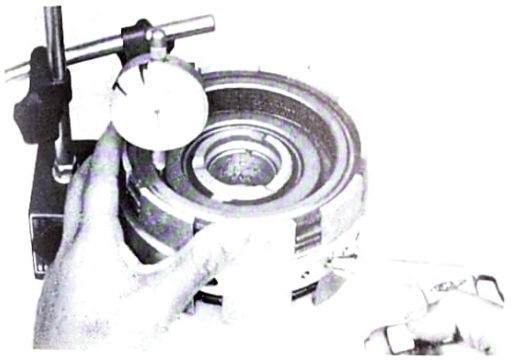
Stroke: 0.65 – 1.30 mm (0.0256 – 0.0512 in.)



17. TURN CENTER SUPPORT OVER AND INSTALL BRAKE NO.2 DISCS, PLATES AND FLANGE

Install in following order: Plate-disc-plate-disc-plate-disc-flange.

CAUTION: The clutch flange should be installed facing flat side toward disc.



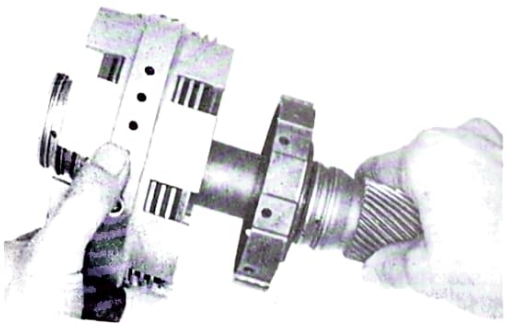
18. INSTALL SNAP RING IN CENTER SUPPORT

CAUTION: Make sure that the ends of the snap ring are not aligned with one of the cutouts.

19. CHECK PISTON STROKE OF BRAKE NO.2

With a dial indicator, apply 4 – 8 kg/cm² (57 – 114 psi) of compressed air and measure the stroke as shown.

Stroke: 1.24 – 2.12 mm (0.0488 – 0.0835 in.)



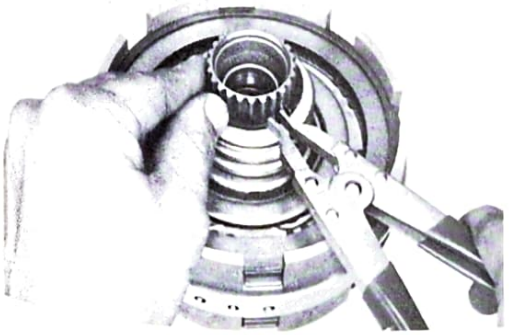
20. ASSEMBLE CENTER SUPPORT AND SUN GEAR SHAFT

(a) Align brake No. 2 disc notches.

(b) Start sun gear shaft into center support.

(c) Mesh brake hub with discs, twisting and jiggling hub as required.

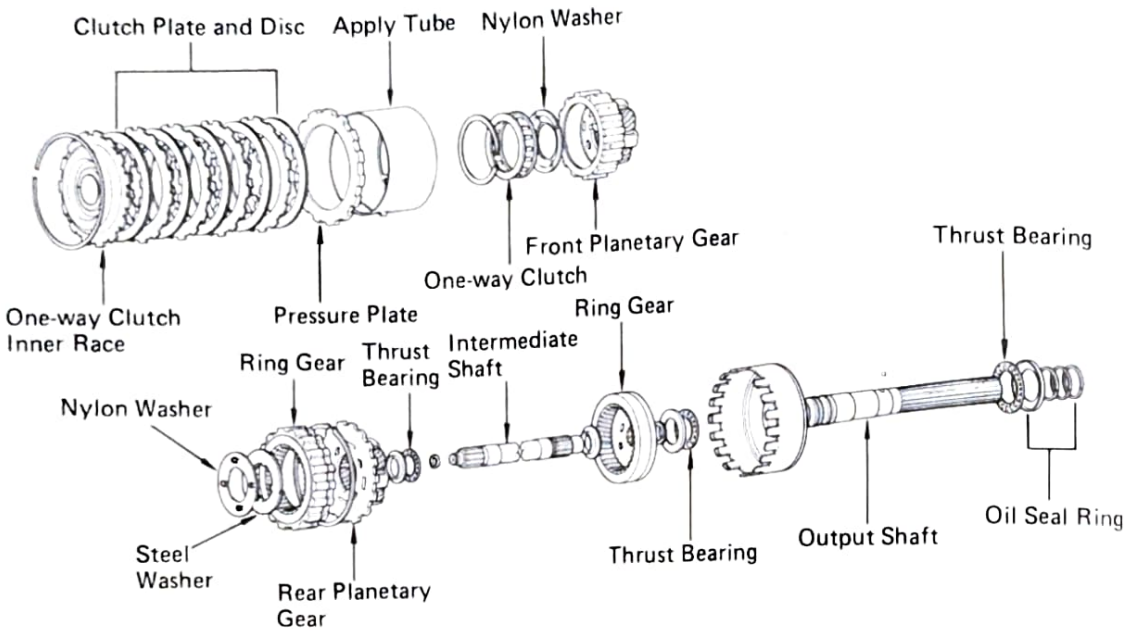
(d) Push sun gear all the way into the center support.



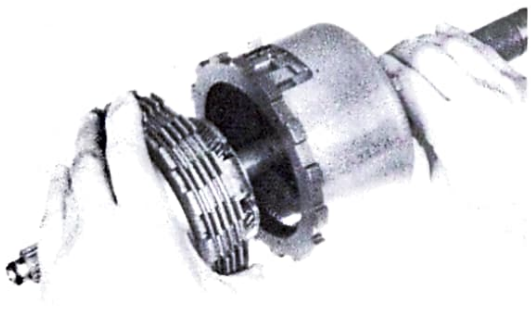
21. INSTALL SNAP RING ON END OF SUN GEAR SHAFT

Spread with snap ring pliers and install in groove.

Planetary Gear Output Shaft

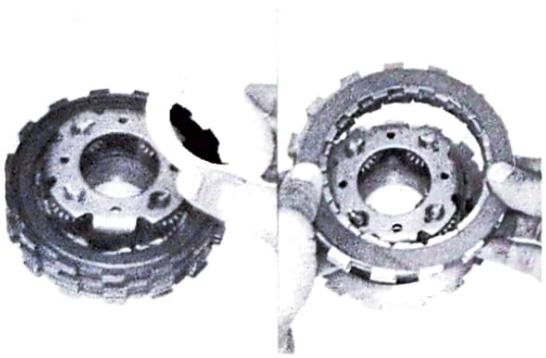


DISASSEMBLY OF PLANETARY GEAR OUTPUT SHAFT



1. **REMOVE BRAKE NO.3 DISC/PLATE PACK AND FRONT PLANETARY GEAR**

   Grasp components and pull off front end of output shaft.



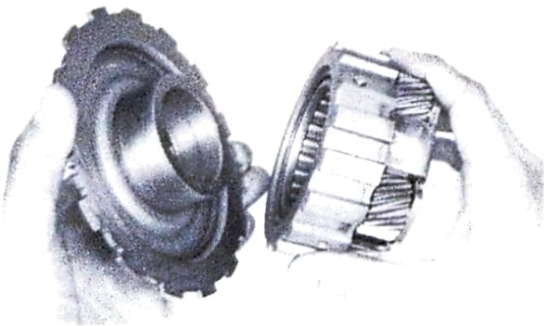
2. **REMOVE NYLON WASHER FROM FRONT PLANETARY GEAR**

   Lift off with hand.

   NOTE: Nylon washer may have stuck to inside of planetary gear case.

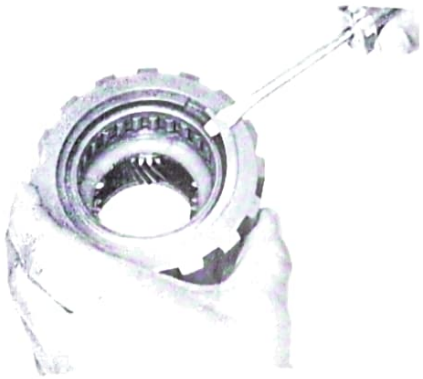
3. **REMOVE BRAKE DISCS AND PLATES FROM FRONT PLANETARY GEAR**

   Lift off the discs and plates, keeping them in exact assembly order. Hold the pack together with a piece of wire.



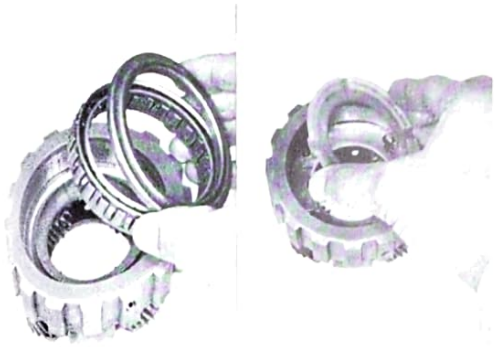
4. **REMOVE ONE-WAY CLUTCH INNER RACE FROM FRONT PLANETARY GEAR**

   Pull apart by hand.



5. REMOVE SNAP RING FROM FRONT PLANETARY GEAR

Using a medium-sized screwdriver, pry out the snap ring.

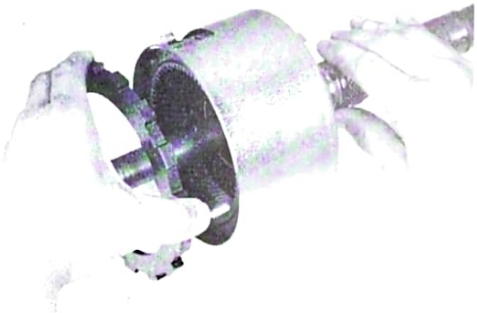


6. REMOVE END BEARING, ONE-WAY CLUTCH AND OTHER END BEARING FROM FRONT PLANETARY GEAR

Lift out by hand.

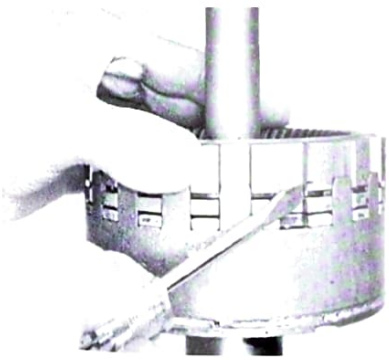
7. REMOVE NYLON WASHER FROM FRONT PLANETARY GEAR

Lift out by hand.



8. REMOVE CLUTCH PRESSURE PLATE AND BRAKE APPLY TUBE

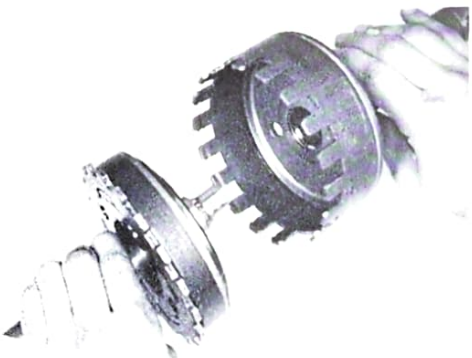
Pull off by hand. Be careful to avoid dropping bearings on output shaft.



9. COMPRESS SHAFT SNAP RING AND REMOVE FRONT PLANETARY RING GEAR

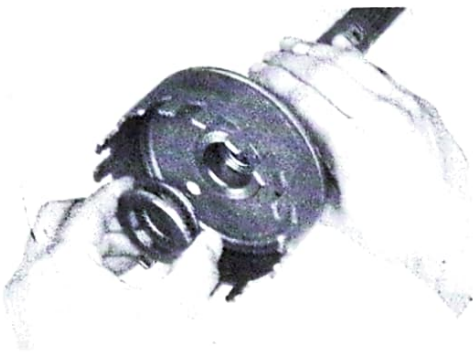
(a) While pulling up the ring gear, compress the snap ring and remove from the groove.

(b) Lift out the ring gear by hand.



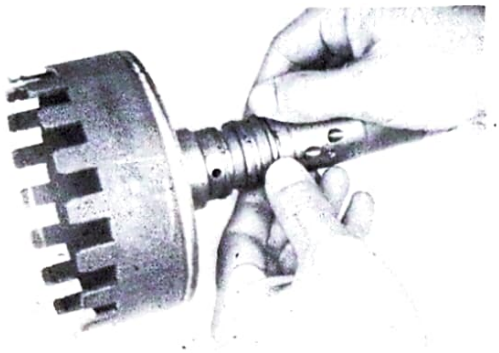
10. SEPARATE INTERMEDIATE SHAFT ASSEMBLY FROM OUTPUT SHAFT ASSEMBLY

Pull apart the two assemblies.



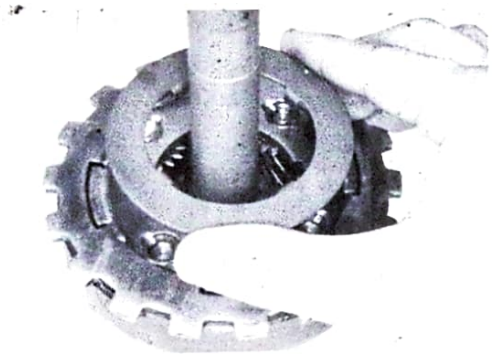
11. REMOVE THRUST BEARING AND RACE FROM OUTPUT SHAFT ASSEMBLY

Lift off by hand. Note position of races.



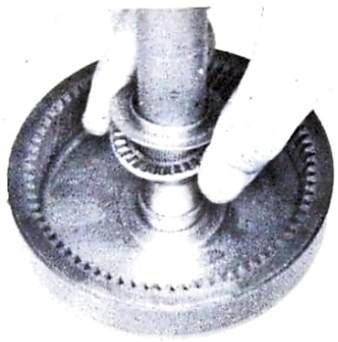
12. REMOVE THREE OIL SEAL RINGS FROM OUTPUT SHAFT

Unhook each ring and slide off end of the shaft.



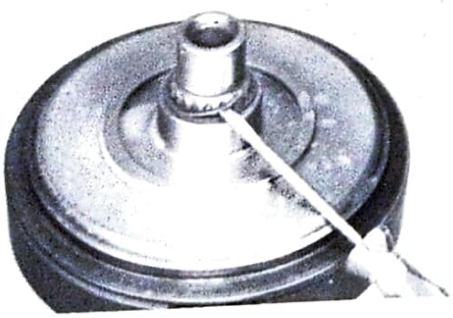
13. REMOVE STEEL THRUST WASHER AND REAR PLANETARY GEAR FROM INTERMEDIATE SHAFT ASSEMBLY

Lift off by hand. Note position of lugs.



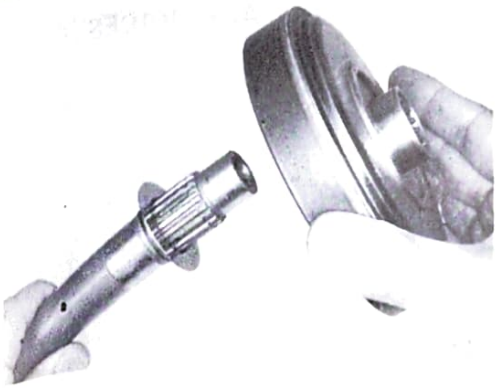
14. REMOVE RACE AND THRUST BEARING FROM INTERMEDIATE SHAFT

Lift off by hand.



15. INVERT INTERMEDIATE SHAFT AND REMOVE SET RING

Use a small screwdriver to open ring and remove by unwinding.



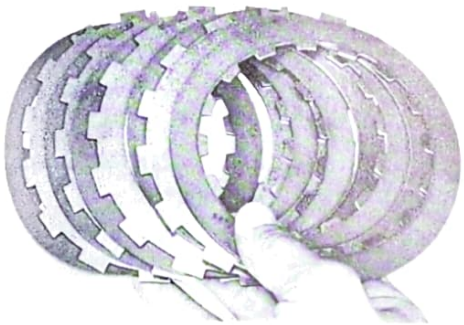
16. REMOVE REAR PLANETARY RING GEAR AND BEARING RACE FROM INTERMEDIATE SHAFT

Lift straight off.

INSPECTION OF PLANETARY GEAR OUTPUT SHAFT

1. CLEAN ALL PARTS – EXCEPT DISCS – IN SOLVENT

Use only fresh, clean solvent. A bristle brush is recommended for cleaning gears. Be sure to maintain assembly order of discs and plates during cleaning. Dry parts with compressed air.



2. INSPECT PLATES AND DISCS

(a) Check outer and inner lugs for wear.

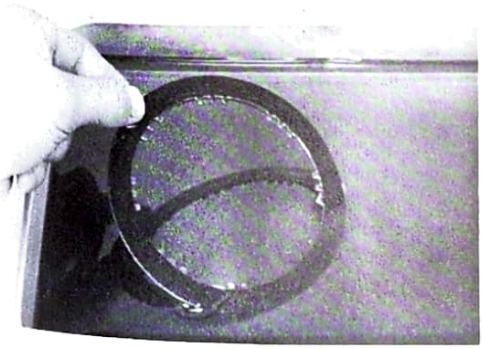
(b) Check disc and plate surfaces for burning (black appearance).

(c) Check for scoring, flaking or debonding of disc friction surfaces.

(d) Check for warpage (discs and plates should be flat).

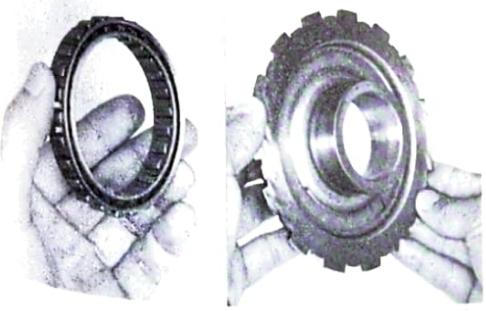
(e) Measure thickness of each disc. Minimum allowable thickness is 2.1 mm (0.083 in.).

(f) Replace any damaged or worn discs or plates.



3. DO NOT ALLOW DISCS TO DRY; PREPARE NEW DISCS

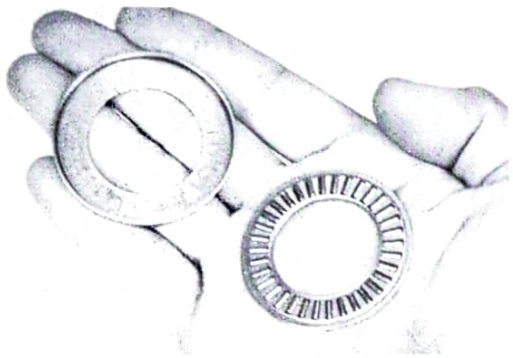
Discs being reused should not be allowed to dry out. If necessary, immerse disc/plate packs in ATF. Prepare new discs for installation by soaking at least two hours in ATF.



4. INSPECT ONE-WAY CLUTCH AND INNER RACE

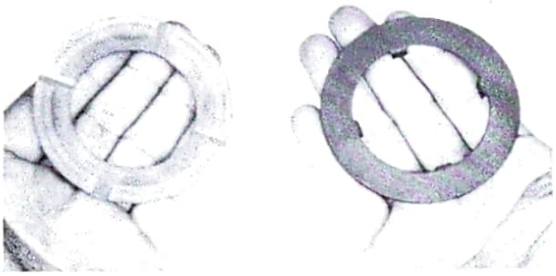
(a) Check sprags, ribbon spring and end surfaces for wear or damage.

(b) Check lugs, disc sliding surface and bearing race for wear or damage.



5. **INSPECT THRUST BEARINGS AND RACES**

Check needle bearings and races for wear, burning, binding or damage.



6. **INSPECT NYLON AND STEEL THRUST WASHERS**

Check for wear, warping, burning or cracking.

7. **INSPECT FRONT AND REAR PLANETARY GEARS**

(a) Check thrust surfaces for warping, wear or burning.

(b) Check lugs for wear or damage.

(c) Check for worn or chipped gear teeth.

(d) Check inner (one-way clutch) surface of front planetary carrier for wear or damage.

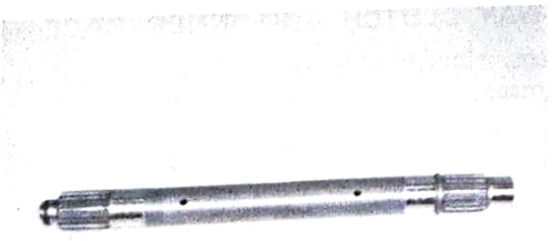
(e) Check pinion gear pins. No play is allowable.

8. **INSPECT FRONT AND REAR PLANETARY RING GEARS**

(a) Check internal gear teeth for wear or damage.

(b) Check parking pawl lugs on front gear for wear or damage.

(c) Check internal splines of rear gear for wear or damage.



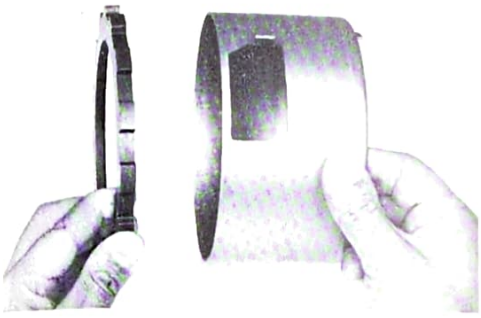
9. **INSPECT INTERMEDIATE SHAFT**

(a) Check oil holes for clogging.

(b) Check splines, bushing journal, ring groove and seal ring for wear, deformation or damage.

(c) Check oil seal ring for wear or damage.

10. INSPECT OUTPUT SHAFT
    (a) Check oil holes and governor oil passages for clogging.
    (b) Check thrust bearing, inner bushing and bushing journal surfaces for wear, burning or scoring.
    (c) Check rear splines for wear, twisting or damage.



11. INSPECT APPLY TUBE AND PRESSURE PLATE
    Check for wear, deformation, cracks, burning or other damage.

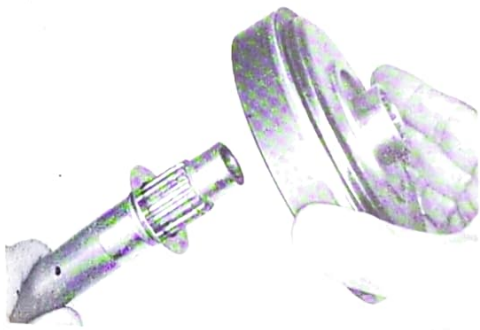
12. INSPECT ALL OTHER PARTS

ASSEMBLY OF PLANETARY GEAR OUTPUT SHAFT

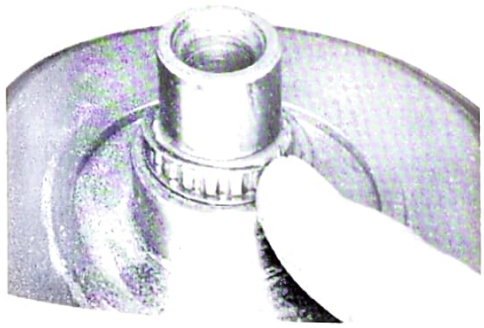
(See illustration on page 10-72)

GENERAL ASSEMBLY NOTE:

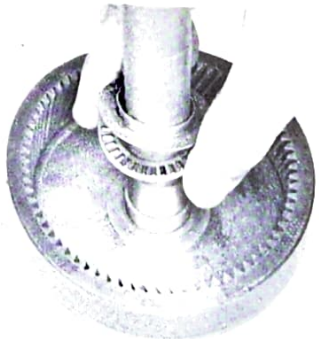
Be sure to coat all friction surfaces, bearing races, thrust faces and sliding surfaces with ATF during assembly.



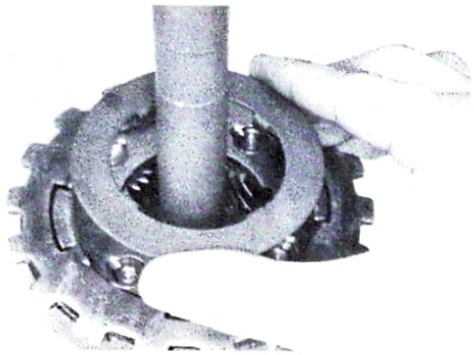
1. INSTALL THRUST BEARING RACE AND REAR PLANETARY RING GEAR ON INTERMEDIATE SHAFT
    Slip thrust bearing race and ring gear onto shaft with exterior splines up, as shown.



2. INSTALL SET RING ON INTERMEDIATE SHAFT
    Push down and wind into place. Check to make sure it is secure.



3. TURN INTERMEDIATE SHAFT OVER AND INSTALL THRUST BEARING AND RACE
    Make sure that flat side of race is against bearing.

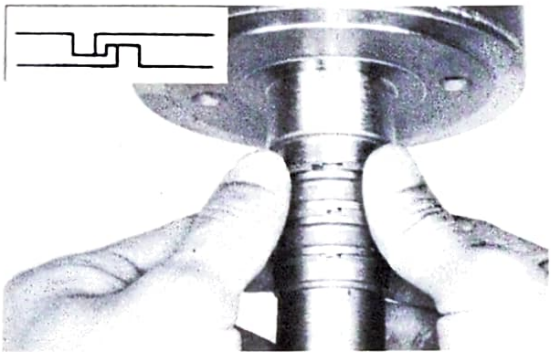


4. **INSTALL REAR PLANETARY GEAR AND STEEL THRUST WASHER ONTO INTERMEDIATE SHAFT**

   (a) Rotate gear to make sure that all pinion gears fully mesh with ring gear.

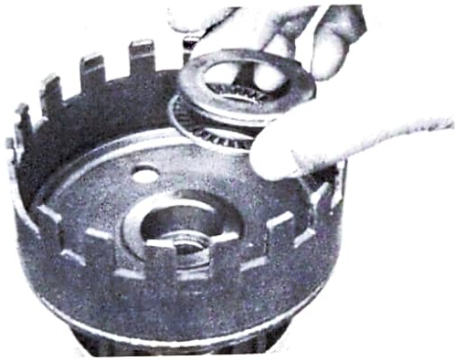
   (b) Install washer with lugs down, fitting into rear planetary gear carrier.

   CAUTION: Make sure that different lug shapes match openings on plate.



5. **INSTALL THREE OIL SEAL RINGS ON OUTPUT SHAFT**

   Slide into place and hook both ends.

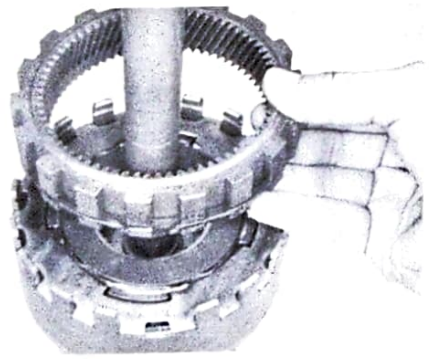


6. **USE EXTENSION HOUSING AS ASSEMBLY STAND**

   Set the output shaft in the extension housing for the next four steps.

7. **INSTALL THRUST BEARING AND RACE ON OUTPUT SHAFT**

   Hold cup of the race toward the bearing.

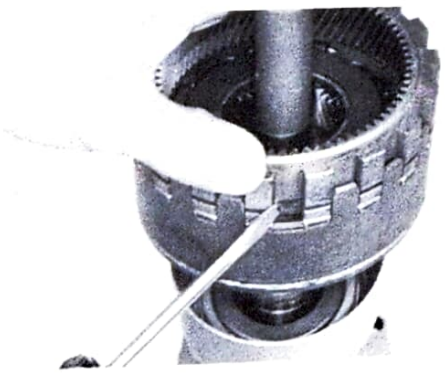


8. **INSTALL INTERMEDIATE SHAFT ASSEMBLY INTO OUTPUT SHAFT**

   Slide into place, and make sure that lugs interlock.

9. **SET IN PLACE FRONT PLANETARY RING GEAR**

   Slide snap ring downward, and align lugs with notches. Align ends of snap ring with wide gap between teeth.



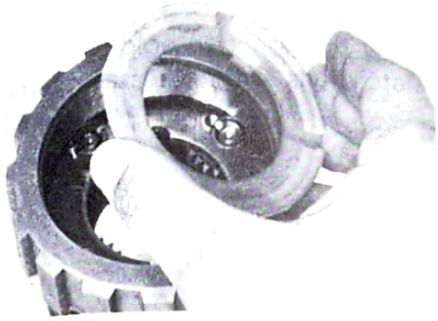
10. **INSTALL FRONT PLANETARY RING GEAR WITH SNAP RING**

    While pushing down ring gear, squeeze snap ring end with a screwdriver and install into the groove.

    NOTE: When the snap ring is fully seated, the gap is the width of one lug.

11. **LIFT ASSEMBLY OUT OF EXTENSION HOUSING**

    The whole assembly should come out as a single unit.

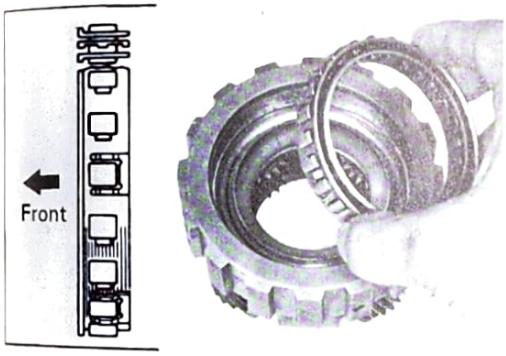


12. INSTALL NYLON THRUST WASHER INTO FRONT PLANETARY GEAR

Face lugs downward and match them with slots in back of planetary gear.

13. INSTALL END BEARING

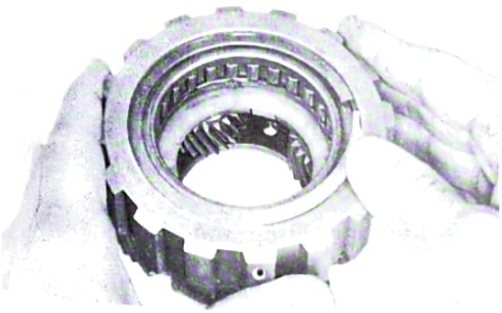
Push into place with cup side up.

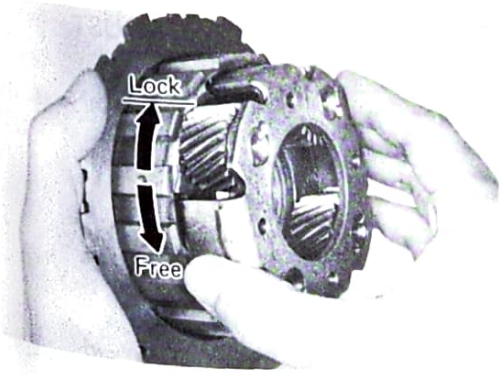


14. INSTALL ONE-WAY CLUTCH

Install one-way clutch into the outer race facing spring cage toward front.

15. INSTALL END BEARING AND SNAP RING





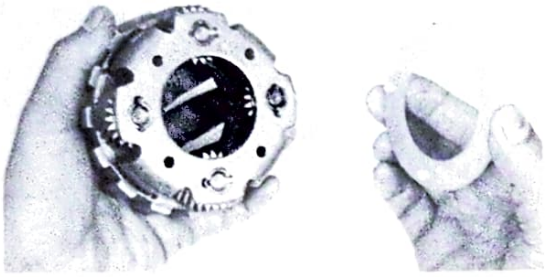
16. CHECK OPERATION OF ONE-WAY CLUTCH

(a) Temporarily install the one-way clutch inner race into the front planetary gear.

(b) Hold the inner race and turn the front planetary gear. The front planetary gear should turn freely counter-clockwise and should lock clockwise.

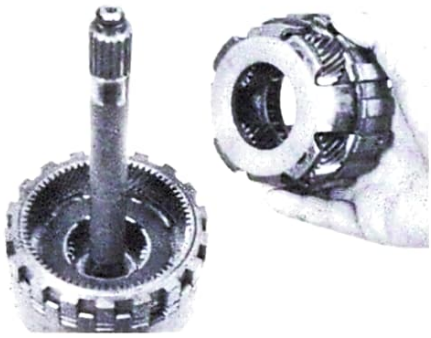
If the one-way clutch does not work properly, replace it.

(c) Remove the inner race.



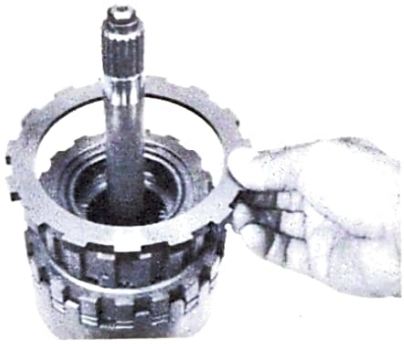
17. INSTALL NYLON THRUST WASHER ON FRONT PLANETARY GEAR

Apply petroleum jelly to washer to hold it in place during later assembly. Match lugs with planetary carrier while installing.



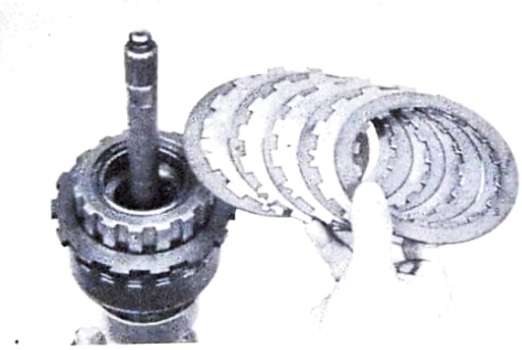
18. INSTALL FRONT PLANETARY GEAR ASSEMBLY TO INTERMEDIATE SHAFT

Slide over shaft and mesh pinion gears with ring gear.



19. INSTALL CLUTCH PRESSURE PLATE

Install pressure plate facing flat surface toward intermediate shaft.

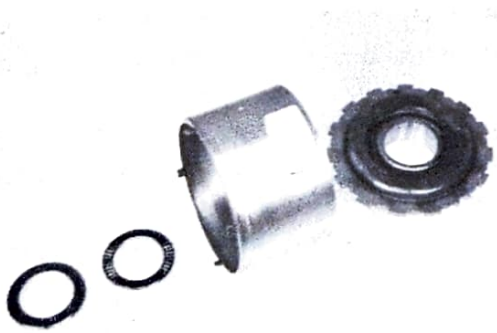


20. INSTALL BRAKE NO. 3 CLUTCH PACK

Do not install dry discs. Use low-pressure compressed air to blow off excess ATF or measurement of clutch pack height will be inaccurate.

CAUTION: Do not use high-pressure air because discs may be damaged. If reusing original components, keep in order.

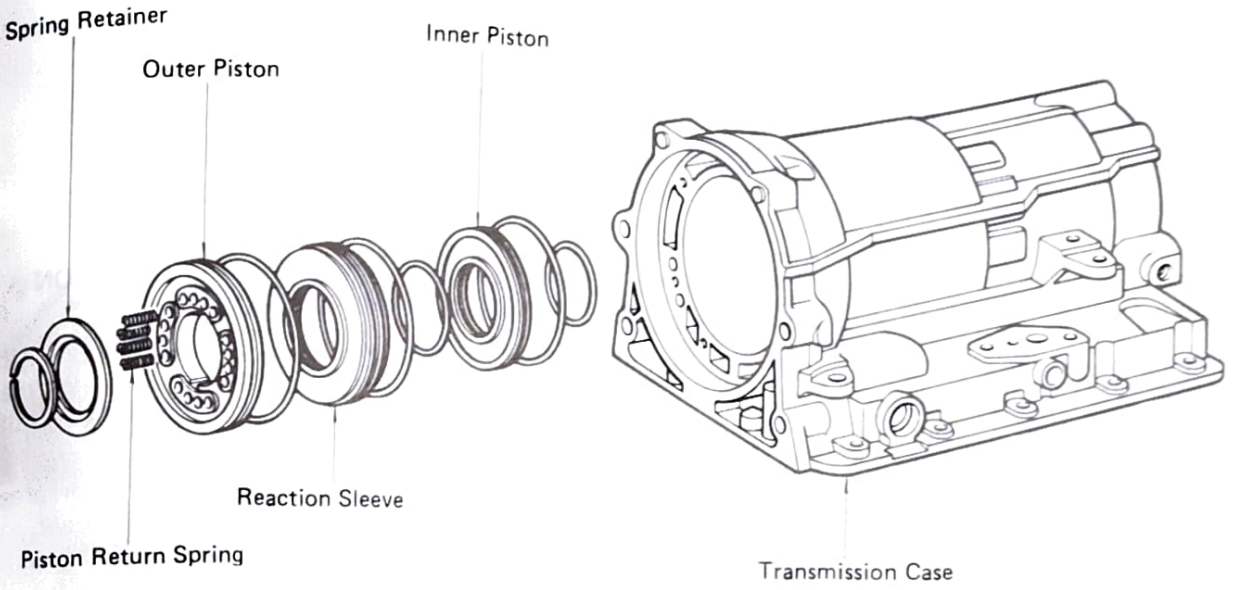
Install in: Disc-plate-disc-plate-disc-plate-disc-plate-disc.

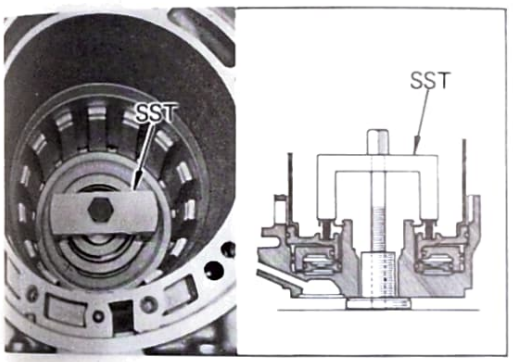


21. KEEP INNER RACE, APPLY TUBE, THRUST BEARING AND RACE TOGETHER

The parts left over will be installed later, as the transmission is assembled.

Transmission Case and Rear Brake Pistons



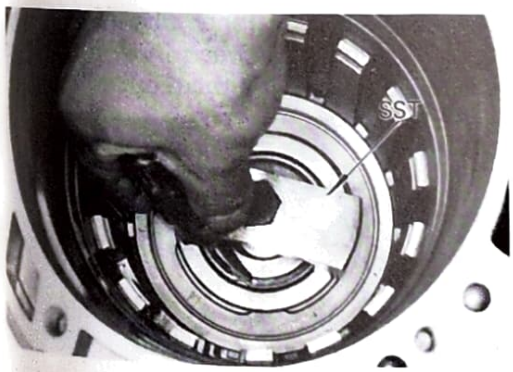


DISASSEMBLY OF TRANSMISSION CASE AND REAR BRAKE PISTONS

1. COMPRESS RETURN SPRINGS AND REMOVE SPRING RETAINER SNAP RING

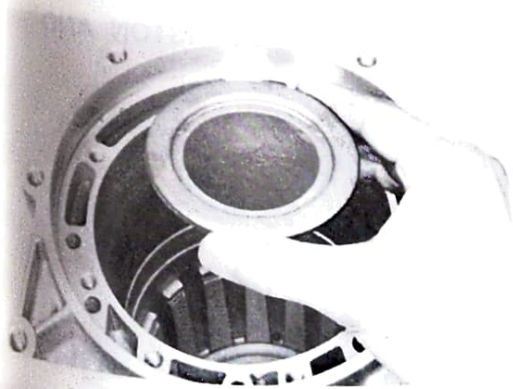
   (a) Install spring compressor*. Gradually and evenly tighten bolts to compress springs.

   *SST 09350-20013 or 00002-00223-03



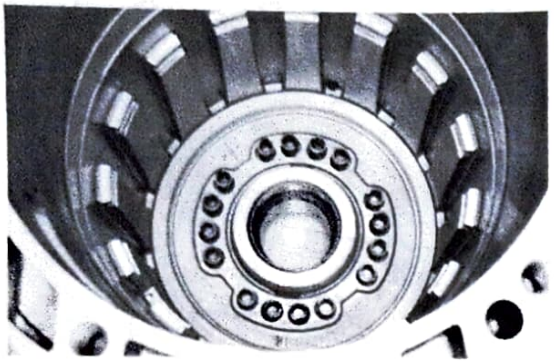
   (b) Using a screwdriver, remove snap ring.

   (c) Carefully remove SST.



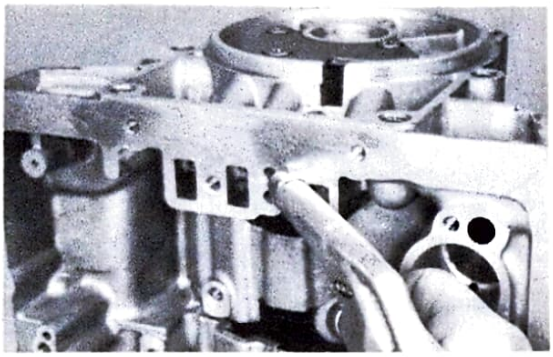
2. REMOVE SPRING RETAINER

   Lift out spring retainer.



3. **REMOVE PISTON RETURN SPRINGS**

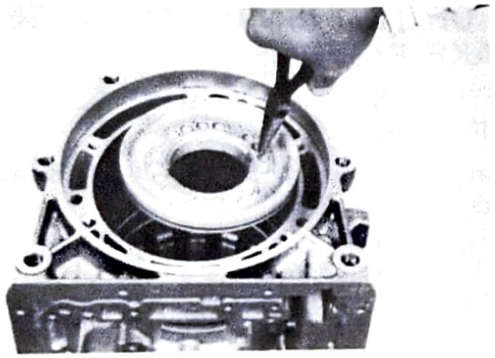
Lift out sixteen return springs. Keep together.



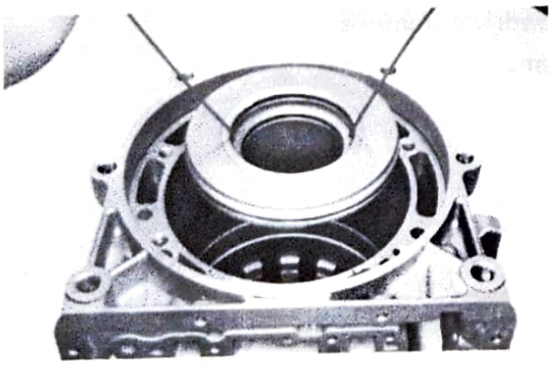
4. **REMOVE OUTER PISTON AND REACTION SLEEVE WITH COMPRESSED AIR**

Turn the case over with face down on workbench. Place several clean shop rags under the case to catch the piston and sleeve. To pop out, apply compressed air to the outer and inner piston oil holes.

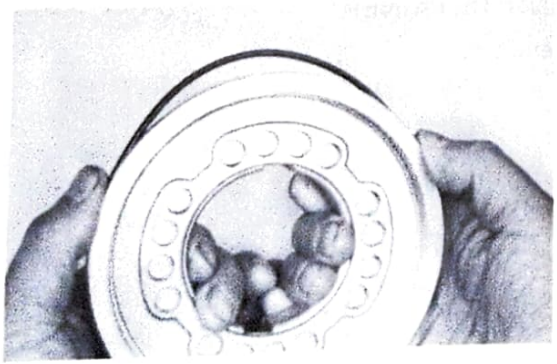
If piston and sleeve do not pop out with compressed air, remove them in accordance with following order.



(a) Lift outer piston from case, using needle nose pliers.



(b) Apply compressed air to the inner piston oil holes, then insert two long hooks between inner piston and reaction sleeve and gradually lift them out of case.



5. **REMOVE O-RINGS FROM OUTER PISTON AND REACTION SLEEVE**

Pull off by hand and discard O-rings.

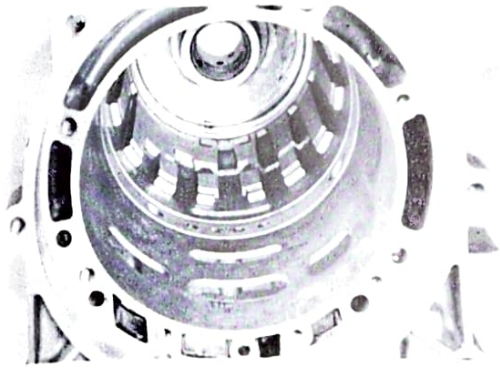
INSPECTION OF CASE COMPONENT

1. CLEAN PARTS IN SOLVENT

Use only clean solvent. Make sure that all gasket residue is removed, but do not scrape finished gasket surfaces with metal tools. A stiff bristle brush is OK.

2. DRY PARTS WITH COMPRESSED AIR

With compressed air, dry parts and blow all fluid passages to clear solvent.



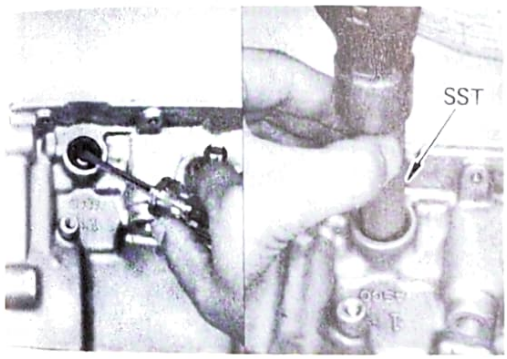
3. INSPECT CASE

(a) Carefully inspect case for cracks or damage.

(b) Check gasket surfaces for warp or gouges.

(c) Check piston bores, O-ring sliding surfaces and output shaft bushing for gouges, wear or damage.

(d) Using compressed air, blow all fluid passages to make sure that they are unclogged.



4. INSPECT MANUAL SHAFT OIL SEALS

Check for wear, damage or cracks.

Replace the oil seals as follows, if necessary.

(a) Remove manual shaft oil seals with a screwdriver.

CAUTION: **Be careful not to damage bore.**

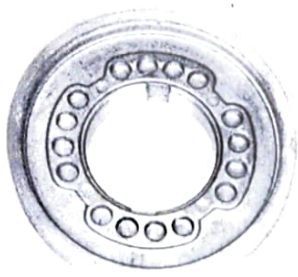
(b) Drive in new left and right oil seals with an oil seal replacer*.

*SST 09350-20013 or Commercial replacer

5. INSPECT PISTON RETURN SPRINGS AND RETAINER

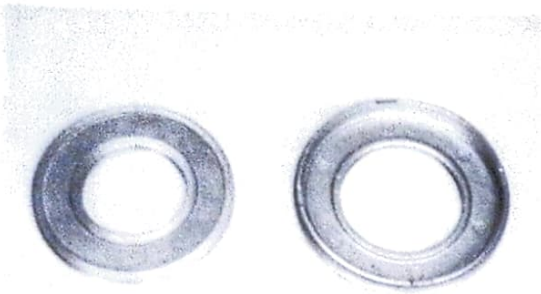
Check for equal height and for broken springs.

Check retainer for wear or damage.



6. INSPECT OUTER PISTON

Check sliding surfaces, O-ring grooves and spring seats for wear or damage.

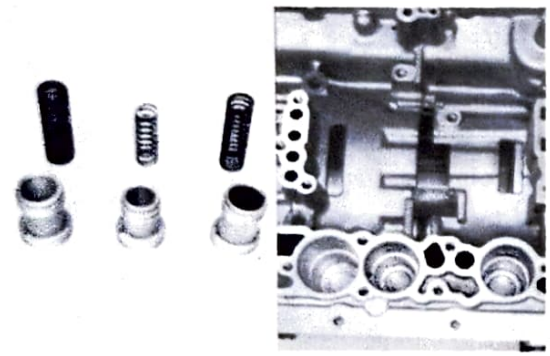


7. **INSPECT INNER PISTON AND REACTION SLEEVE**

Check sliding surfaces, O-ring grooves for wear or damage.

8. **INSPECT MANUAL VALVE LEVER AND PARKING LOCK PAWL**

Check for wear or damage.



9. **INSPECT ACCUMULATOR SPRINGS AND PISTONS**

(a) Check piston grooves and sliding surfaces for wear, cracks or damage.

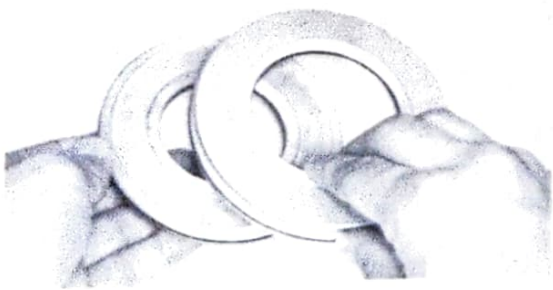
(b) Check that springs are not broken or damaged.

(c) Replace O-rings with new ones.

ASSEMBLY OF TRANSMISSION CASE AND REAR BRAKE PISTONS

(See illustration on page 10-81)

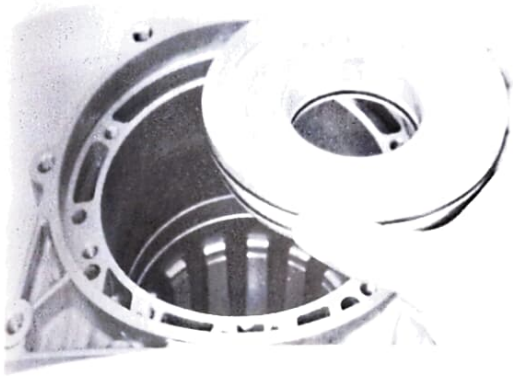
NOTE: Make sure all parts are clean before beginning assembly.



1. **INSTALL INNER PISTON IN REACTION SLEEVE WITH NEW O-RINGS**

Place O-rings on inner piston and reaction sleeve.

CAUTION: Thinner O-ring goes on outside of reaction sleeve. Lightly lubricate O-rings with ATF, and push inner piston into cupped side of reaction sleeve.



2. INSTALL OUTER PISTON IN REACTION SLEEVE

Lubricate the O-rings with ATF, and push the outer piston onto the other side of the reaction sleeve.

3. INSTALL PISTONS AND SLEEVE INTO CASE

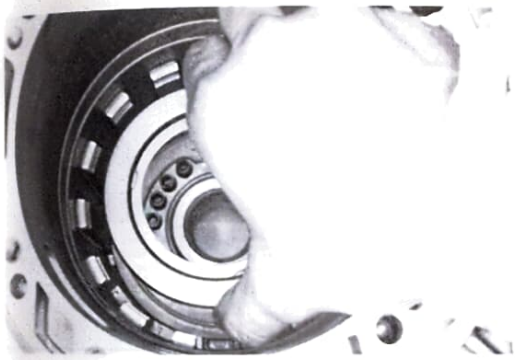
CAUTION: **Be careful not to damage the O-rings.**

Hold the assembly with the outer piston up (spring seats visible), and push the assembly into its bore in the case.

4. INSTALL SIXTEEN PISTON RETURN SPRINGS

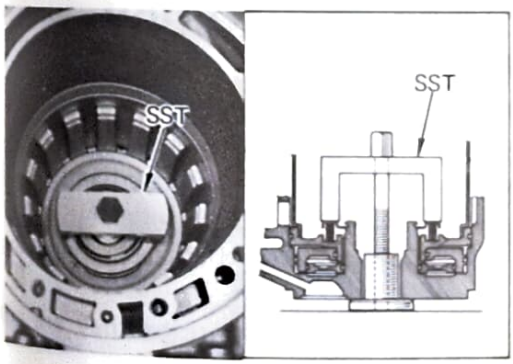
Apply petroleum jelly to the end of each spring to hold it in place. Install springs in seats on top of outer piston.

NOTE: Springs are visible through cutout in case, which helps position them more easily.



5. INSTALL SPRING RETAINER

Position the retainer on the springs, being careful not to knock over the springs.



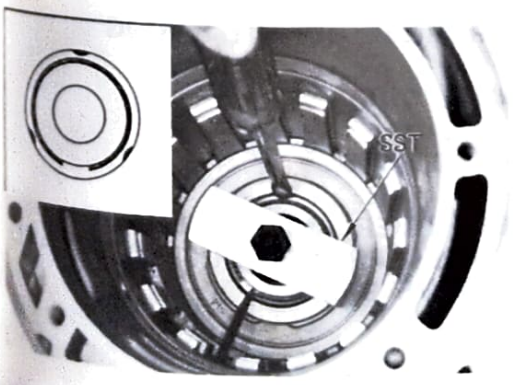
6. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

CAUTION: **Do not over-tighten the bolts as this will bend the spring retainer.**

(a) Carefully position the spring compressor* on the spring retainer.

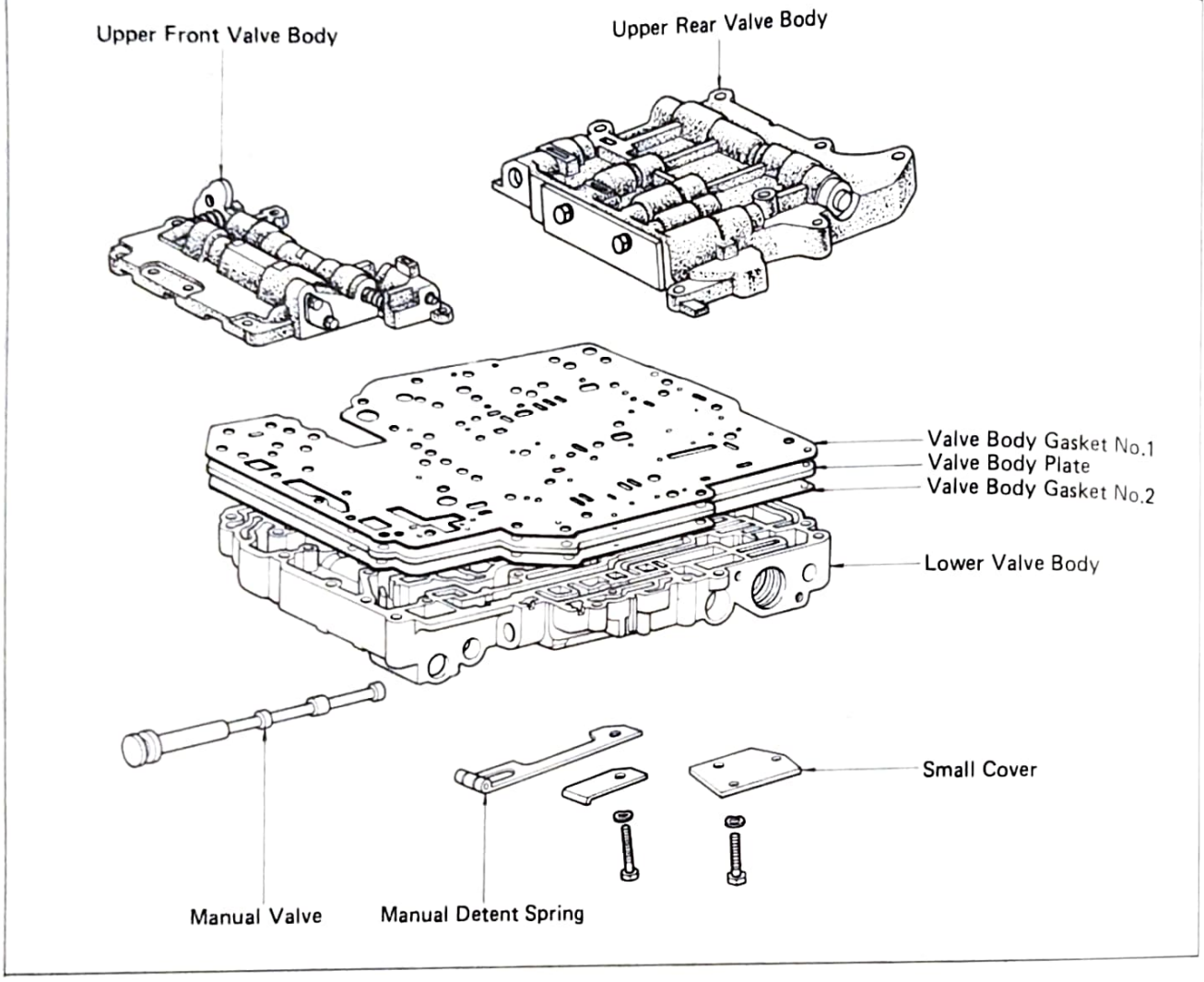
(b) Gradually and evenly tighten the bolts to compress the springs and keep retainer centered.

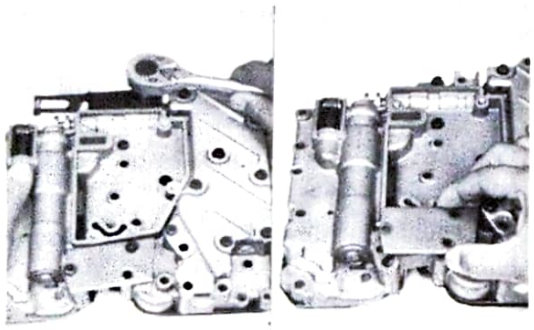
*SST 09350-20013 or 00002-00223-03



(c) Push the snap ring into place with two screwdrivers. Visually check to make sure that it is fully seated and centered by three lugs on spring retainer.
Remove the SST.

Valve Body





DISASSEMBLY OF VALVE BODY

GENERAL DISASSEMBLY NOTES:

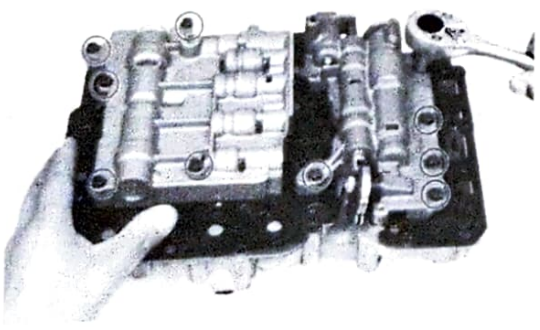
(a) To facilitate assembly, arrange parts in order.

(b) Do not scratch valve faces or raise burrs in valve bores. Never force a valve into or out of its bore; damage will result.

(c) Be careful not to lose check balls when separating valve bodies.

(d) Be careful not to mix up or lose springs; they are not interchangeable.

1. UNBOLT AND REMOVE DETENT SPRING

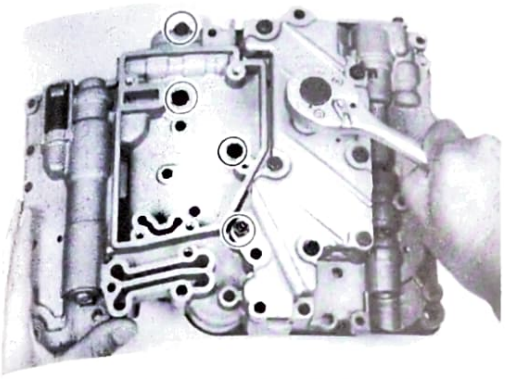


2. REMOVE MANUAL VALVE

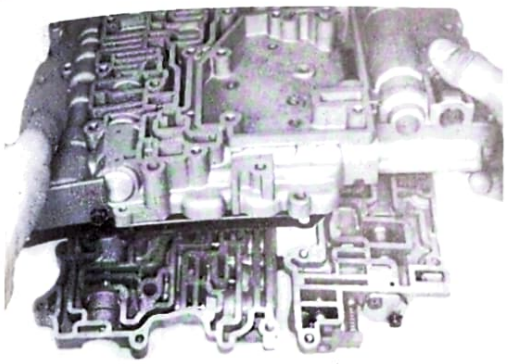
3. REMOVE SMALL COVER

4. TURN ASSEMBLY OVER AND REMOVE TEN BOLTS FROM UPPER FRONT VALVE BODY AND UPPER REAR VALVE BODY

   Remove ten bolts.



5. TURN ASSEMBLY OVER AND REMOVE FIVE BOLTS FROM LOWER VALVE BODY

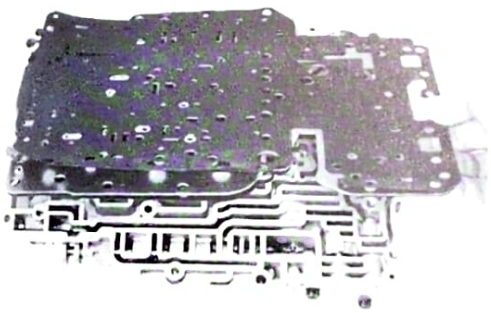


6. LIFT OFF LOWER VALVE BODY AND PLATE AS SINGLE UNIT

Hold the lower valve and plate together so that the check valve and ball do not fall out. Turn the lower valve body over and set on the workbench.

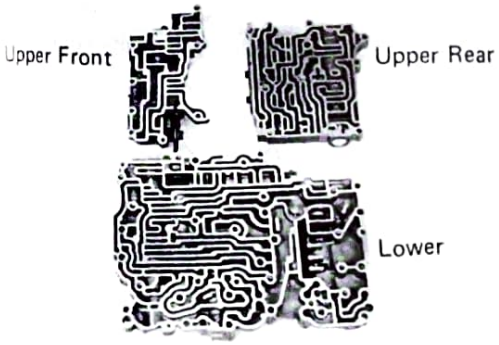
NOTE: Be sure that other two valve bodies do not stick to gasket – they should remain on workbench.

Carefully set aside other two valve bodies.



7. REMOVE LOWER VALVE BODY PLATE AND GASKETS

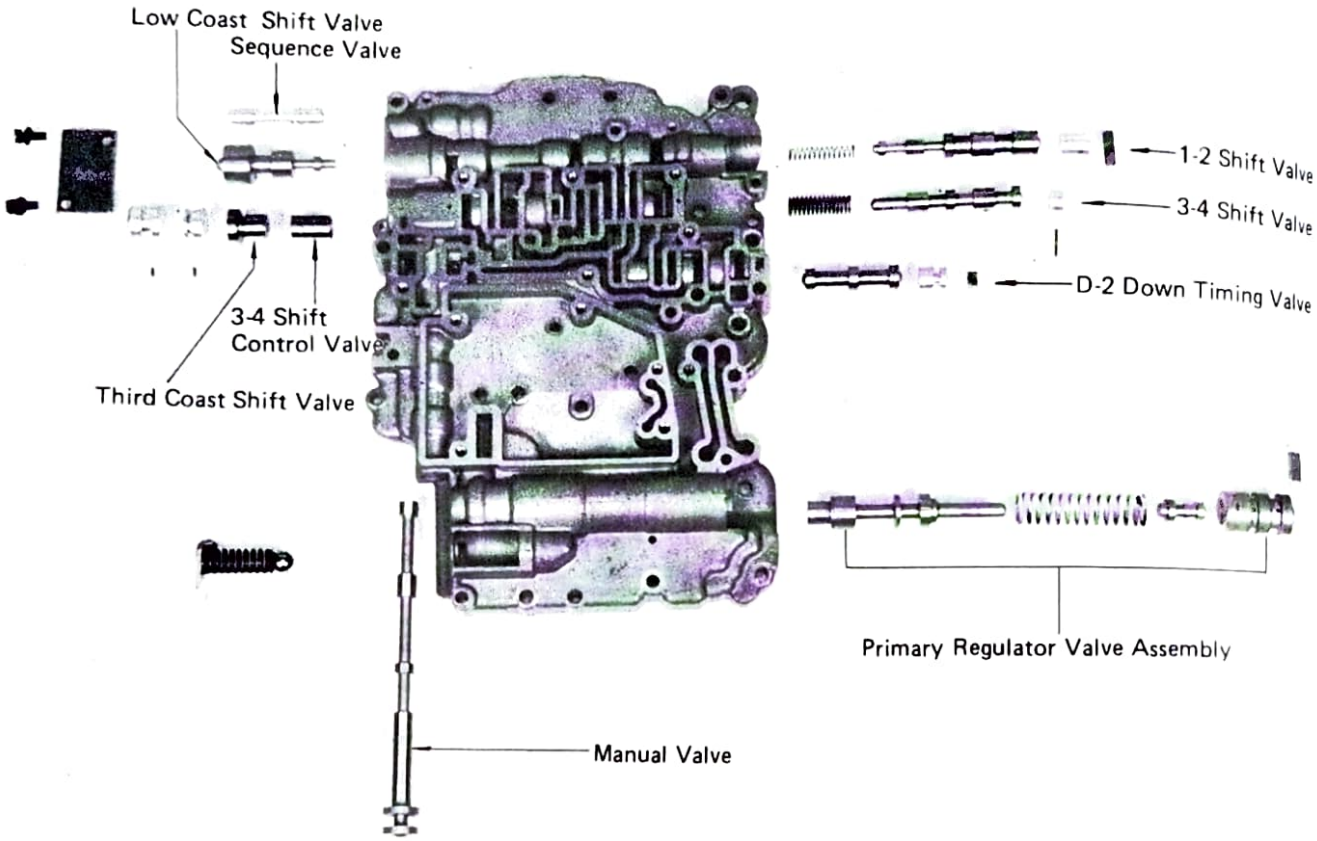
Lift off. Save gaskets for inspection.

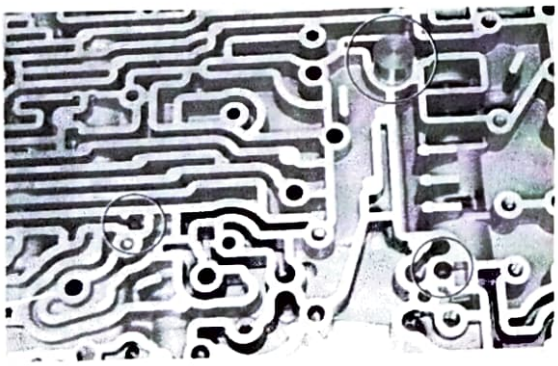


Now valve body has been separated into three parts, namely, lower valve body, upper front valve body and upper rear valve body. Disassemble and inspect each of the three parts.

Lower valve body (A43D) ..... See page 10-90
Upper front valve body ..... See page 10-100
Upper rear valve body ..... See page 10-106

LOWER VALVE BODY

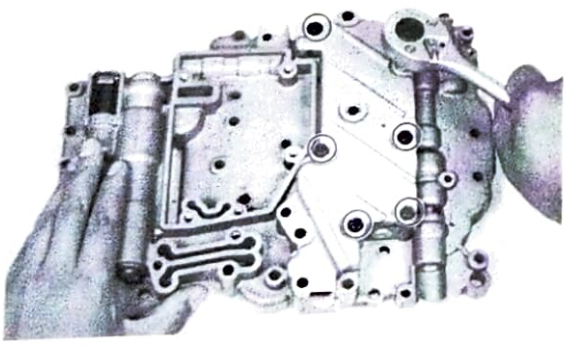




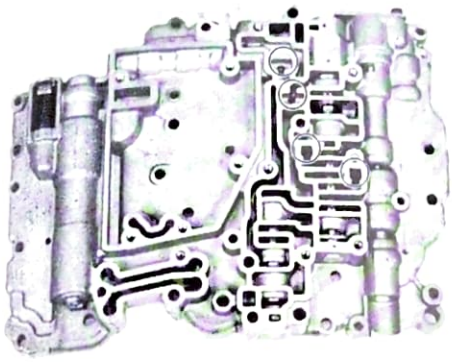
DISASSEMBLY OF LOWER VALVE BODY

1. **NOTE POSITION OF CHECK BALLS AND VALVE**
   These are loose parts.

2. **REMOVE COOLER BY-PASS CHECK VALVE AND SPRINGS**
   Lift out of valve body. Keep spring with check valve.

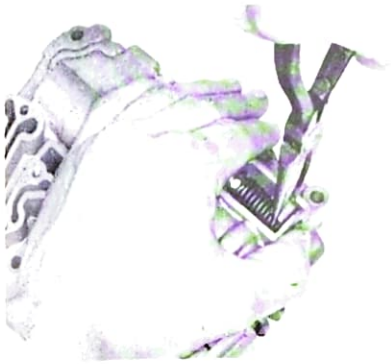


3. **TURN ASSEMBLY OVER AND REMOVE SIX BOLTS AND REMOVE LOWER BODY COVER, PLATE AND GASKETS**
   Lift off cover and carefully remove plate and gaskets.



4. REMOVE FOUR CHECK BALLS

Remove four check balls being careful not to scratch grooves. Keep balls together to prevent losing them.

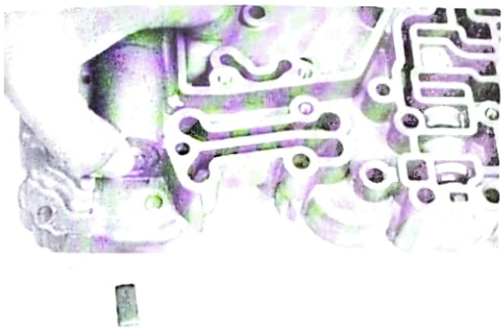


5. REMOVE SPRING RETAINER FROM PRESSURE RELIEF ASSEMBLY

CAUTION: Cover spring with hand. Then, with needle nose pliers, slowly pull out spring seat, being careful not to bend spring.

6. REMOVE PRESSURE RELIEF SPRING AND BALL

Lift out the spring. Tilt the body to remove the ball. Keep spring with ball.



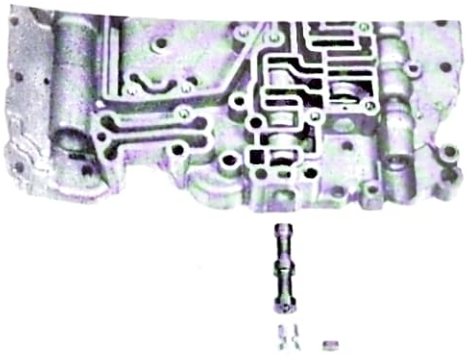
7. REMOVE SPRING RETAINER FROM PRIMARY REGULATOR VALVE

WARNING: Highly compressed spring inside – keep away from face.

To remove retainer, hold valve body face down, and press in on valve sleeve. Retainer will drop out. Slowly relieve spring compression.

8. REMOVE SLEEVE, PLUNGER, SPRING AND PRIMARY REGULATOR VALVE

Tilt the valve body and gently shake to slide out parts. Do not force valve. Keep the spring with the valve.

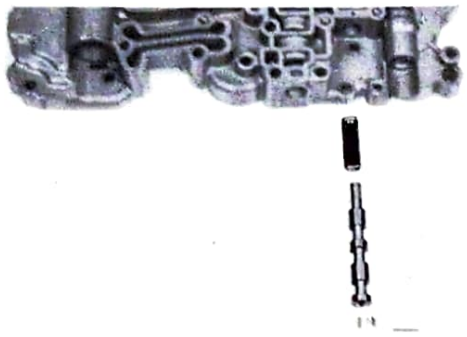


9. REMOVE PLUG RETAINER FOR D-2 DOWN TIMING VALVE

Lift out the retainer.

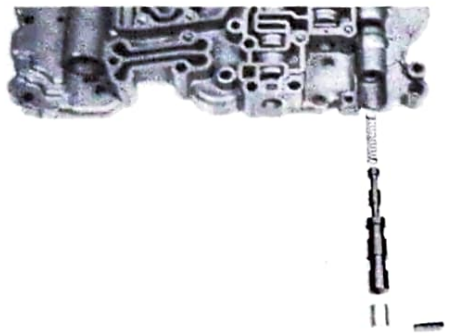
10. REMOVE PLUG AND D-2 DOWN TIMING VALVE

Tilt the valve body and allow to slide out.



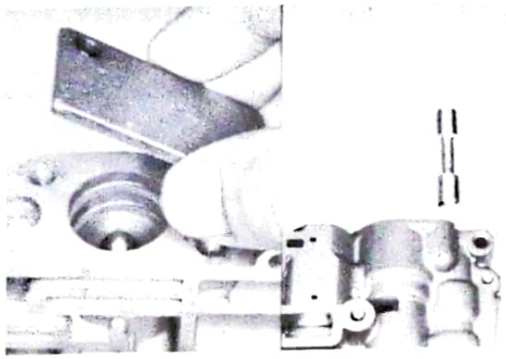
11. **REMOVE LOCATING PIN FOR 3-4 SHIFT VALVE**
Be careful not to lose the pin.

12. **REMOVE PLUG, 3-4 SHIFT VALVE AND SPRING**
Tilt the valve body and allow to slide out. Keep spring with valve.



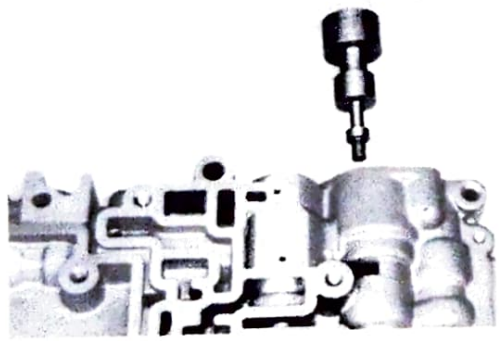
13. **REMOVE PLUG RETAINER FOR 1-2 SHIFT VALVE**
Push up from underneath with finger and lift out.

14. **REMOVE PLUG, 1-2 SHIFT VALVE AND SPRING**
Tilt the valve body and allow to slide out. Keep spring with valve.

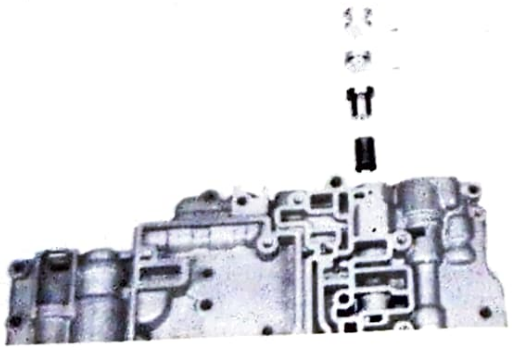


15. **REMOVE COVER PLATE**

16. **REMOVE SEQUENCE VALVE**
Tilt the body to remove valve.



17. **REMOVE LOW-COAST SHIFT VALVE**
Tilt the body and gently shake out low-coast shift valve.



18. **REMOVE TWO LOCATING PINS FOR THIRD COAST SHIFT VALVE**
Be careful not to lose the pins.

19. **REMOVE PLUGS, THIRD COAST SHIFT VALVE AND 3-4 SHIFT CONTROL VALVE**
Tilt the valve body and allow to slide out.

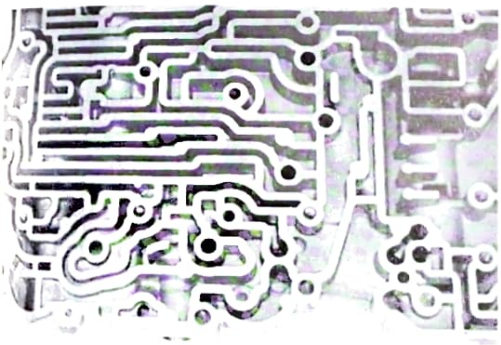
INSPECTION OF LOWER VALVE BODY

1. THOROUGHLY WASH VALVES AND BODY IN CLEAN SOLVENT

   Do not scrape surfaces. Do not use a hot tank or carburetor cleaner. Use only fresh, clean solvent. Dry parts with compressed air.

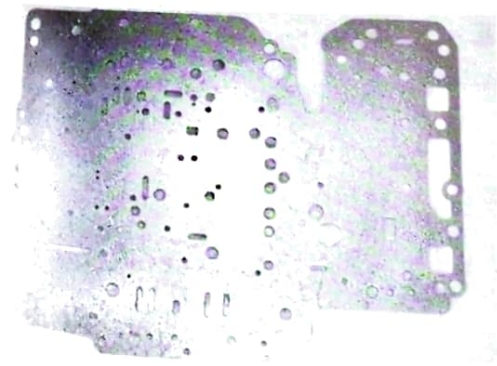
2. INSPECT VALVES AND VALVE BORES

   Check for wear, rust, rough spots, cracks, nicks, deformation or other damage. Make sure that the valves slide freely in the bores.



3. INSPECT FACES, OIL HOLES AND PASSAGES IN VALVE BODY

   Check for clogging, obstruction or leakage between passages. (Also inspect old gasket for indications of leakage.)

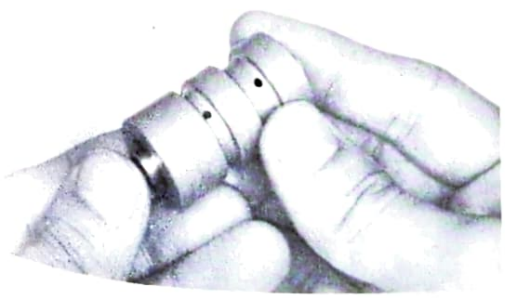


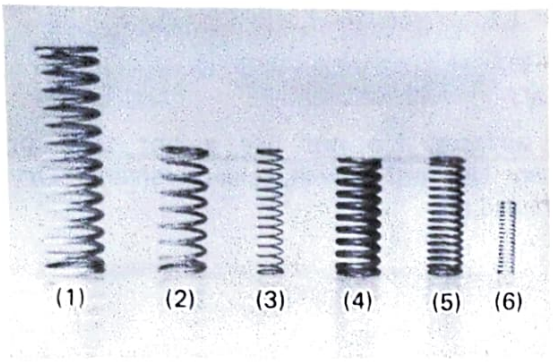
4. INSPECT SEPARATOR PLATE

   Check for flatness or damage. Make sure that all small holes are open.

5. INSPECT REGULATOR VALVE

   Make sure that the plunger moves smoothly.





6. INSPECT VALVE SPRINGS

Check the squareness and check for damage, rust and distorted coils. Measure spring height and replace if less than that shown below.

	Free length mm (in.)	Wire diameter mm (in.)
(1) Primary regulator valve	73.32 (2.8866)	1.59 (0.0626)
(2) 1-2 shift valve	34.62 (1.3630)	0.56 (0.0220)
(3) 3-4 shift valve	33.65 (1.3248)	1.10 (0.0433)
(4) Check valve (for oil cooler)	33.32 (1.3118)	1.32 (0.0520)
(5) Pressure relief valve ball	32.14 (1.2654)	2.03 (0.0799)
(6) Damping ball	20.00 (0.7874)	0.40 (0.0157)

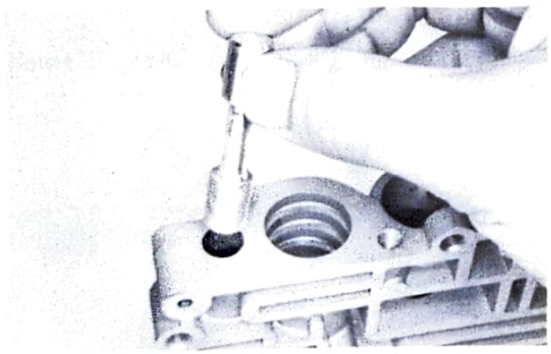
7. INSPECT CHECK AND PRESSURE RELIEF BALLS

Check for wear, damage and improper seating, indicated by a wear line.

ASSEMBLY OF LOWER VALVE BODY
(See illustration on page 10-90)

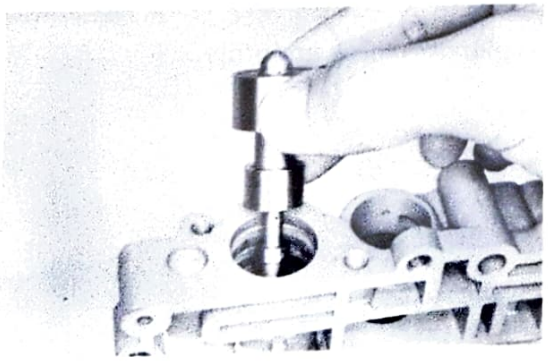
GENERAL ASSEMBLY NOTES:

Make sure that all parts are perfectly clean and air dried before assembly. Lightly lubricate sliding surfaces on each valve with ATF just before inserting in the valve body. All other parts are assembled dry to prevent contamination with shop dust. Make sure workbench and hands are clean.



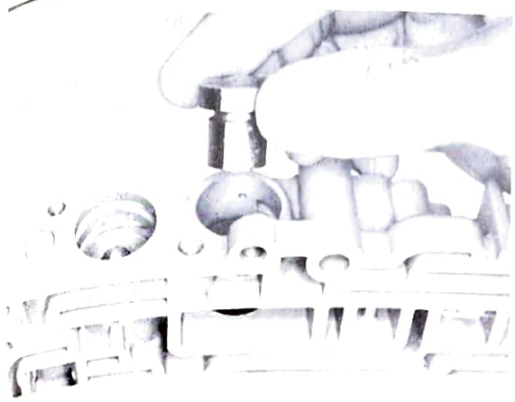
1. INSTALL SEQUENCE VALVE

Insert into bore with care.

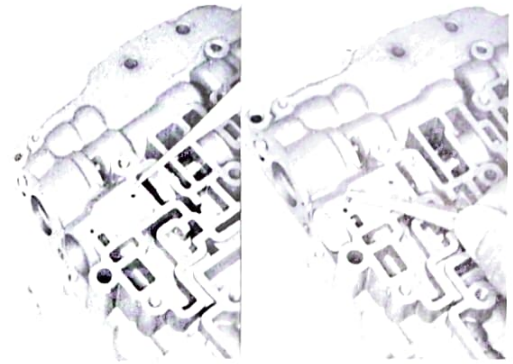


2. INSTALL LOW-COAST SHIFT VALVE

Carefully insert into bore with the small end first.

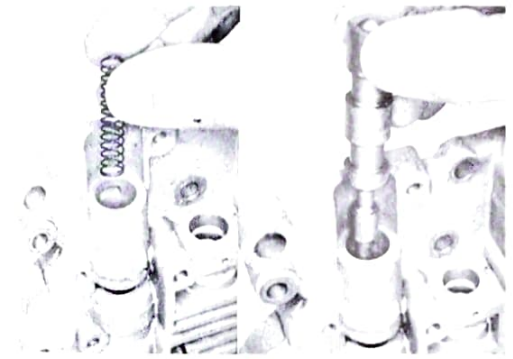


3. INSTALL 3-4 SHIFT CONTROL VALVE AND THIRD COAST SHIFT VALVE
   (a) Insert 3-4 shift control valve with cup side first.
   (b) Insert third coast shift valve with small end first.



4. INSTALL TWO PLUGS AND TWO LOCATING PINS
   (a) Insert straight plug and hold with pin.
   (b) Insert manual valve plug facing rounded end outward and hold with pin.

5. INSTALL COVER PLATE

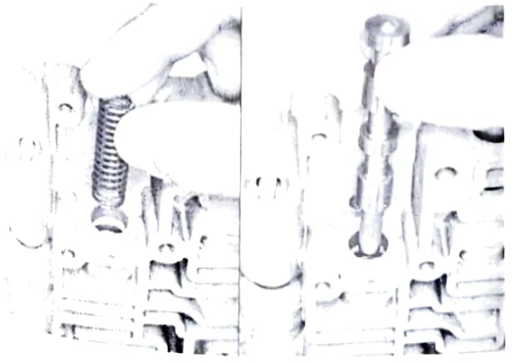


6. INSERT SPRING, 1-2 SHIFT VALVE AND PLUG INTO VALVE BODY

   Set the valve body on edge and carefully insert the spring, 1-2 shift valve (small end first) and plug.

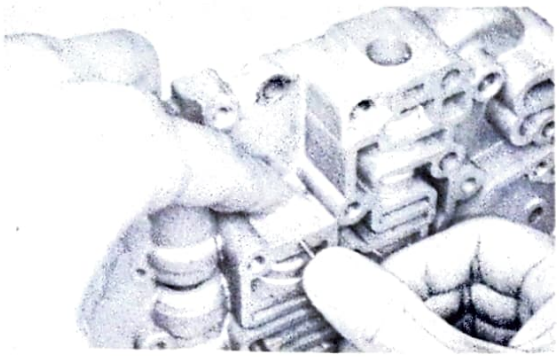
7. INSTALL 1-2 SHIFT VALVE PLUG RETAINER

   Compress the spring and insert retainer in body behind plug. Release pressure on the spring to hold retainer.



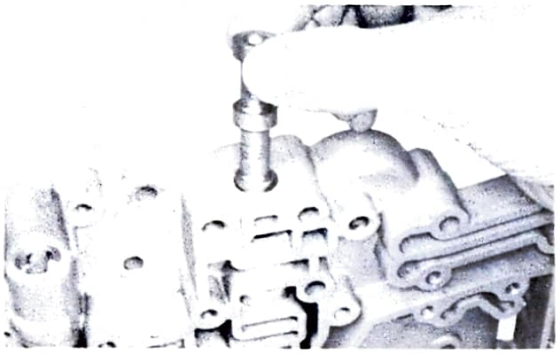
8. INSERT SPRING, 3-4 SHIFT VALVE AND PLUG INTO VALVE BODY

   Set the valve body on edge and carefully insert the spring, 3-4 shift valve (small end first) and plug.



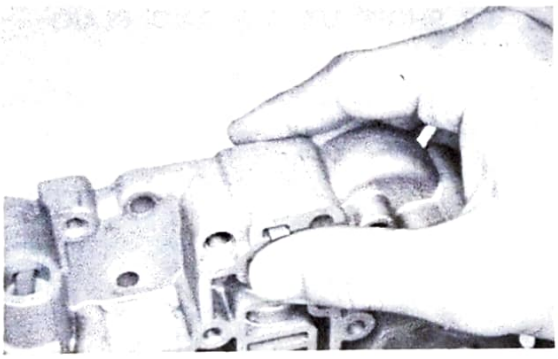
9. INSTALL 3-4 SHIFT VALVE LOCATING PIN

Compress the spring and insert the locating pin in body behind plug. Release pressure on the spring to hold pin.



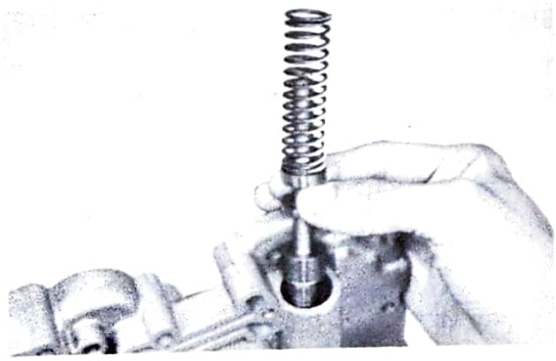
10. INSTALL D-2 DOWN TIMING VALVE AND PLUG

Insert D-2 down timing valve and then plug with large end first.



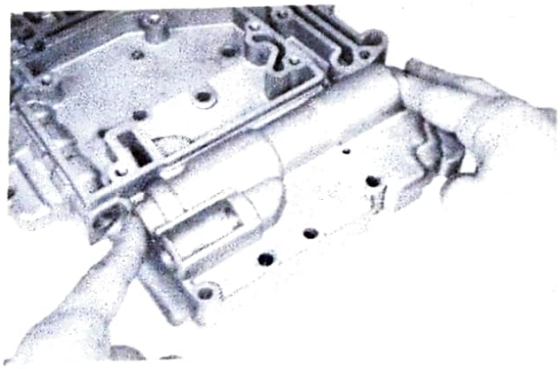
11. INSTALL D-2 DOWN TIMING VALVE RETAINER

Insert the retainer into groove to hold the plug.



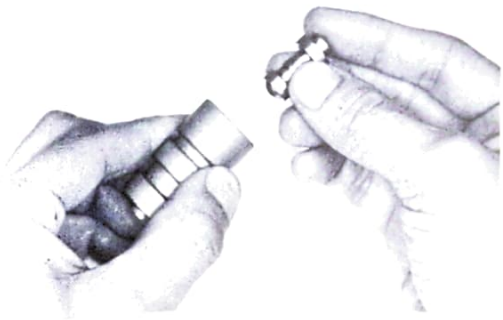
12. INSERT PRIMARY REGULATOR VALVE AND SPRING INTO VALVE BODY

Set valve body on edge and drop in valve and spring.



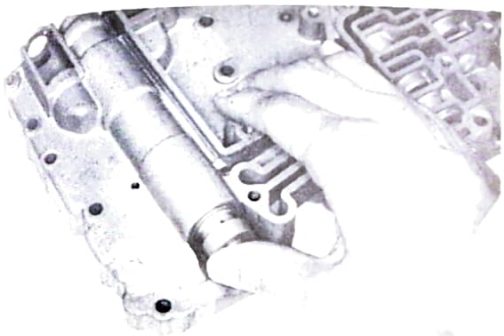
13. CHECK VALVE POSITION

Make sure that primary regulator valve fits flush with the valve body.



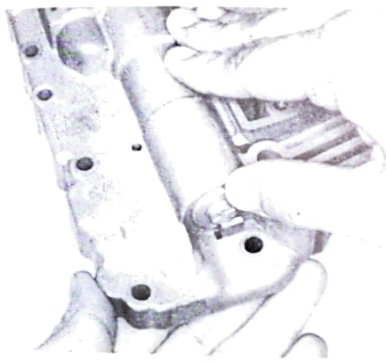
14. INSERT REGULATOR VALVE PLUNGER INTO SLEEVE

Insert with the rounded end first. Make sure that it is fully inserted: the plunger should be recessed inside the sleeve.



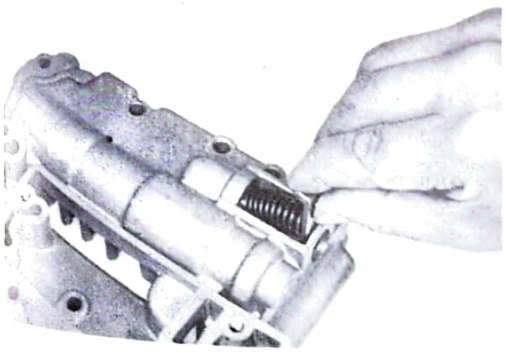
15. INSERT SLEEVE WITH PLUNGER INTO VALVE BODY

Hold valve body level to keep plunger from falling out of the sleeve. Push sleeve with plunger into the valve body.

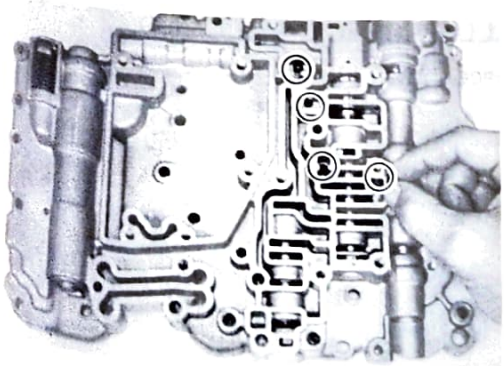


16. INSTALL REGULATOR VALVE SPRING RETAINER

Push in on the sleeve to compress spring until the seat can be installed over the end of the sleeve. Release the spring to hold the retainer.

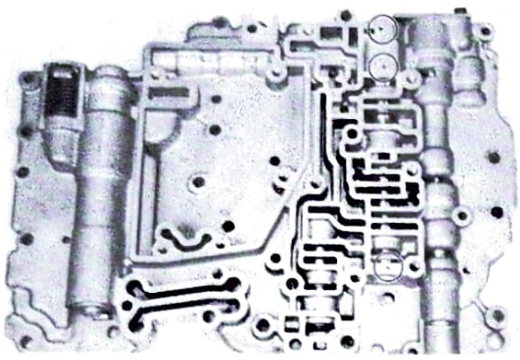


17. INSTALL PRESSURE RELIEF BALL, SPRING AND SEAT IN VALVE BODY



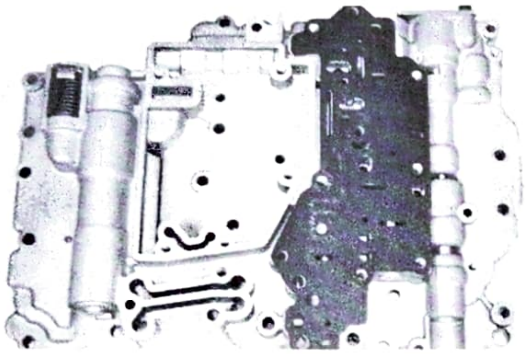
18. INSTALL FOUR CHECK BALLS

Drop into the places shown in the figure.



19. CHECK RETAINERS AND LOCATING PINS

Make sure that the retainers and pins are installed correctly.

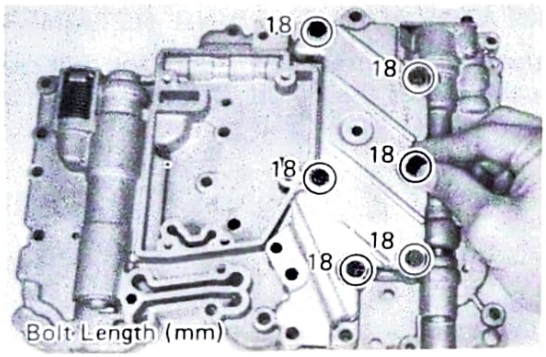


20. INSTALL LOWER BODY COVER

Install in accordance with following order.

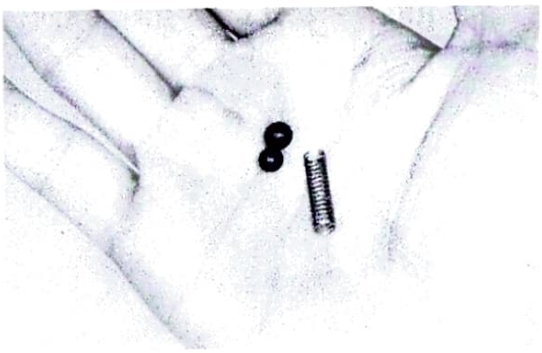
Gasket-plate-gasket-cover.

NOTE: Two gaskets are not interchangeable.



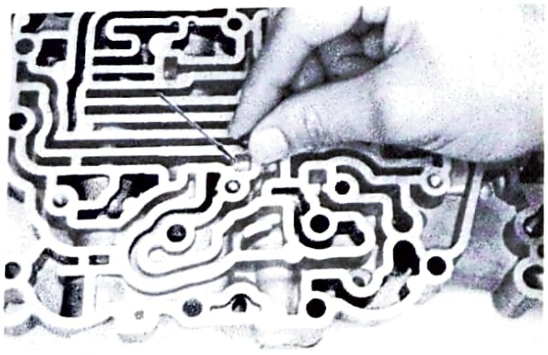
21. INSTALL SIX BOLTS

Align bolt holes. Finger tighten the six bolts of 18 mm in order to hold the lower body cover.



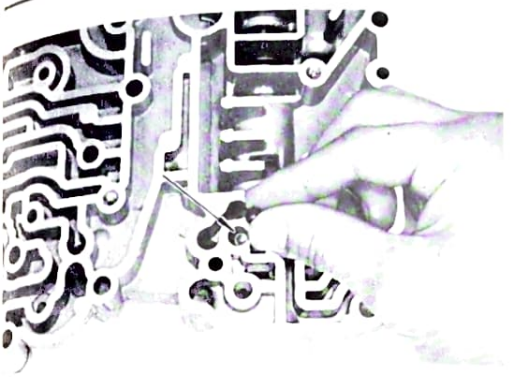
22. IDENTIFY CHECK BALLS AND SPRING

Note different size of two rubber check balls. The spring goes with larger ball.



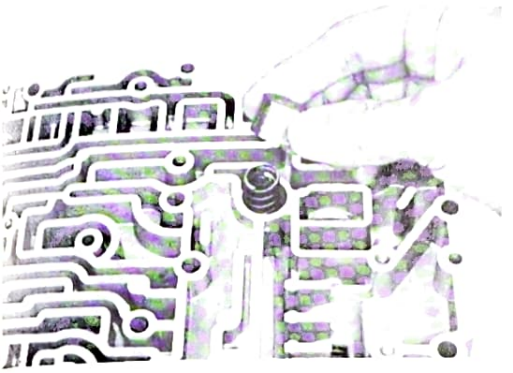
23. INSTALL SMALLER CHECK BALL (NO. 2 BRAKE)

Drop into the place shown in the figure.



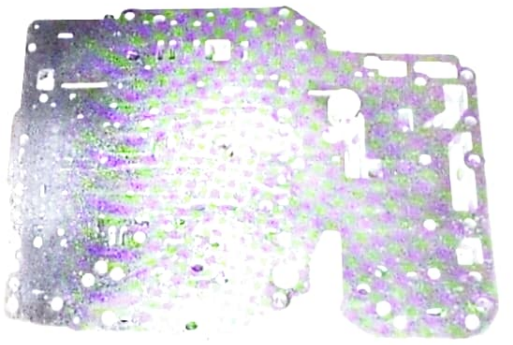
24. INSTALL SPRING AND LARGER CHECK BALL (REGULATOR VALVE DAMPING)

Drop the spring and then check ball into the place shown in the figure.



25. INSTALL SPRING AND COOLER BY-PASS CHECK VALVE

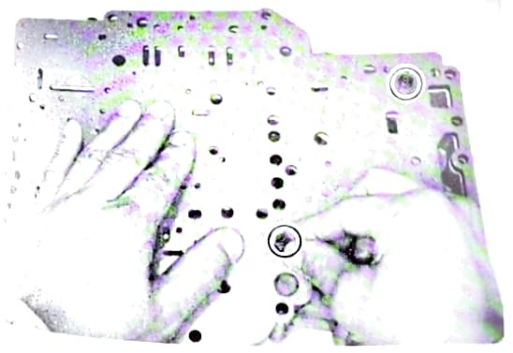
Drop the spring and then check valve into the place shown in the figure.



26. INSTALL LOWER VALVE BODY GASKET

Note that two gaskets are not interchangeable. Gasket must lay flat on the valve body.

CAUTION: **Make sure that new gasket matches old gasket.**



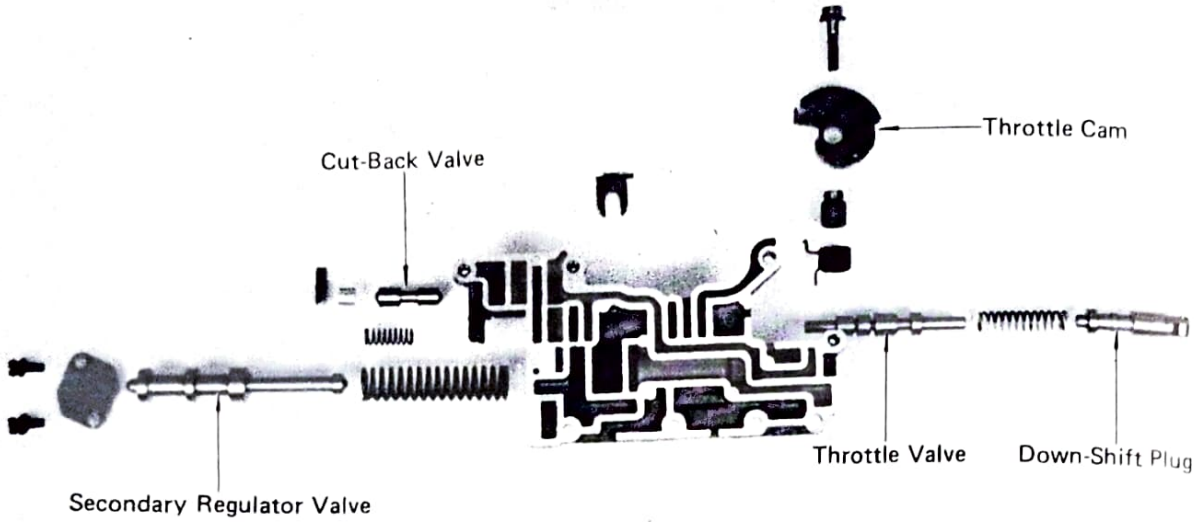
27. INSTALL LOWER VALVE BODY PLATE

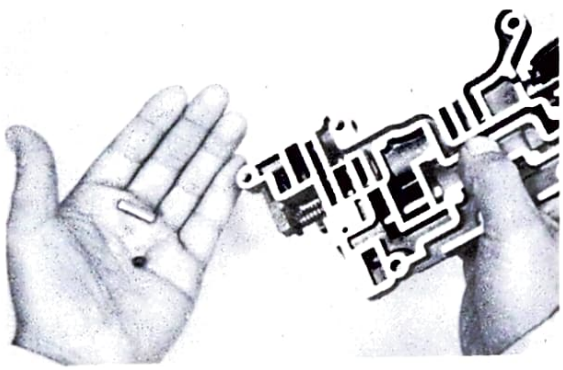
Set plate into place. Temporarily install two short bolts finger tight to compress plate against spring-loaded check valve.

NOTE: Use the bolts for oil strainer.

As for assembly of valve body, see page 10-108.

UPPER FRONT VALVE BODY

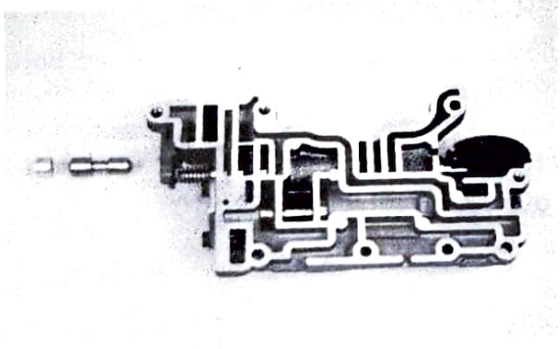




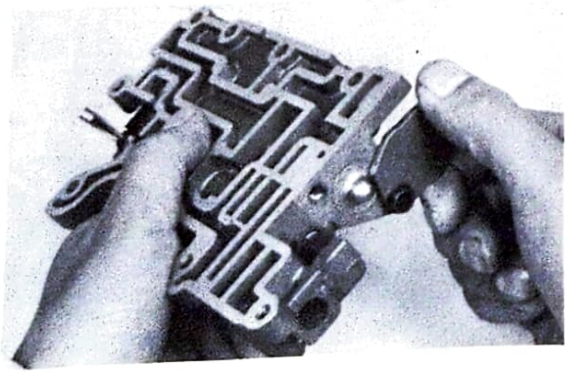
DISASSEMBLY OF UPPER FRONT VALVE BODY

1. **HOLD THUMB ON THROTTLE VALVE RETAINER**
   Hold retainer so that it won't fall out during next step.

2. **REMOVE CHECK BALL AND CUT-BACK PLUG RETAINER**
   Turn upper front valve body over and catch the ball in hand. If retainer does not fall out, shake the valve body.



3. **REMOVE PLUG AND CUT-BACK VALVE**
   Tilt valve body and, if necessary, gently shake to remove plug and valve.

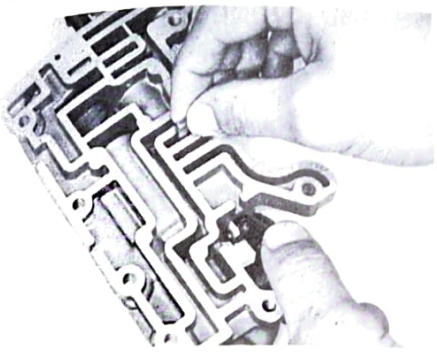


4. **REMOVE SECONDARY REGULATOR VALVE**
   (a) Remove one bolt from the plate over the valve and loosen the other one. Slowly rotate plate to uncover the valve.

   WARNING: Spring-loaded valve.

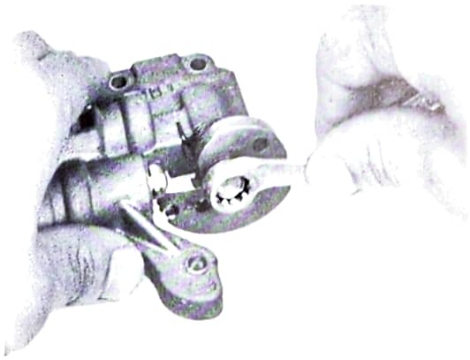
   (b) Remove the valve and spring. Keep spring with the valve.

   (c) Remove the other bolt and remove cover plate.



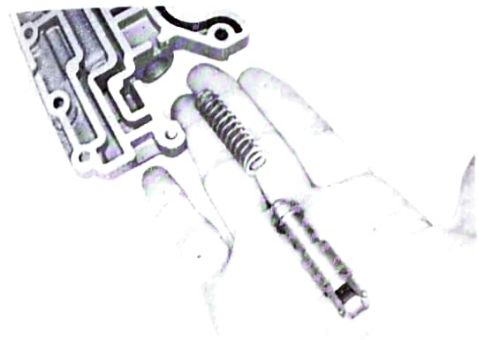
5. PUSH DOWN-SHIFT PLUG INTO VALVE BODY AND TEMPORARILY HOLD

Temporarily hold in position with cut-back valve plug retainer.



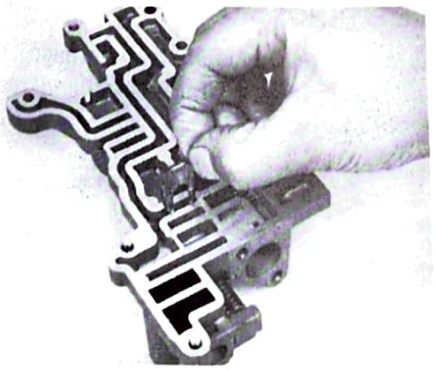
6. REMOVE THROTTLE CAM

Remove cam bolt. Remove washers, cam, sleeve and spring.



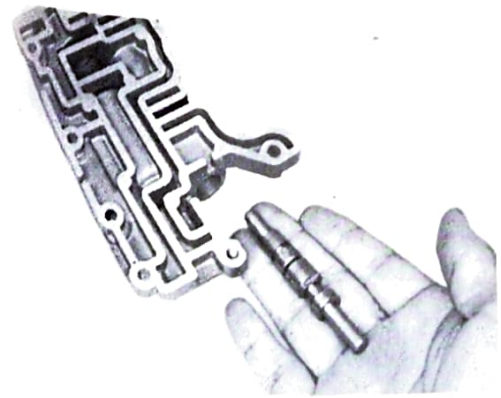
7. REMOVE DOWN-SHIFT PLUG AND SPRING

Press on down-shift plug so that temporary retainer will fall out. Tilt valve body to remove plug and spring. Keep spring with plug.



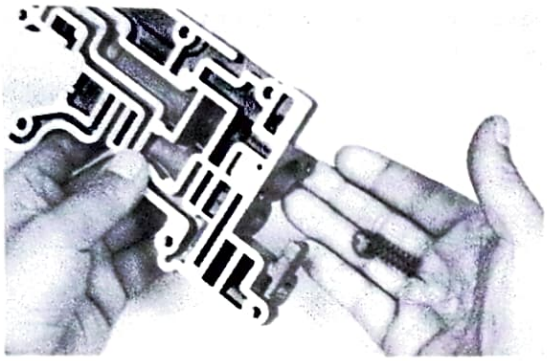
8. PULL OUT THROTTLE VALVE RETAINER

Use needle-nose pliers to lift out retainer.



9. REMOVE THROTTLE VALVE

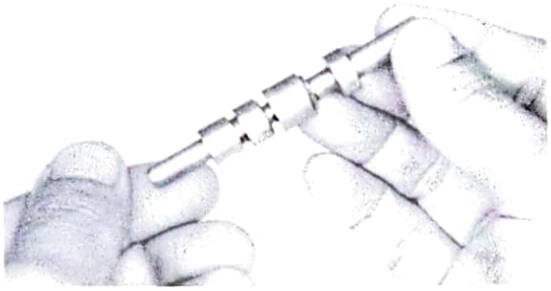
Tilt the valve body to remove the valve.



10. REMOVE SPRING AND E-RING SHIMS

Lift off the spring and shims. Note the number of shims installed.

INSPECTION OF UPPER FRONT VALVE BODY

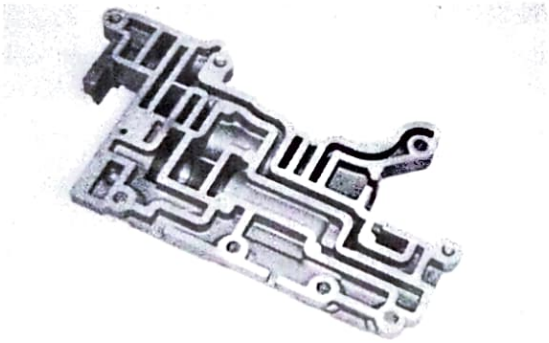


1. THOROUGHLY WASH VALVES AND BODY IN NEW, CLEAN SOLVENT

Be careful not to scratch or nick parts. Dry parts with compressed air.

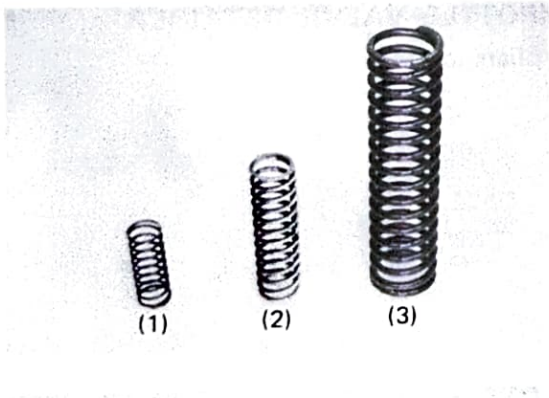
2. INSPECT VALVES AND VALVE BORES

Check for wear, rust, rough spots, cracks, nicks, deformation or other damage.



3. INSPECT FACES, OIL HOLES AND PASSAGES IN VALVE BODY

Check for scratches, clogging, obstruction or leakage between passages. (Also inspect old gasket for indications of leakage.)



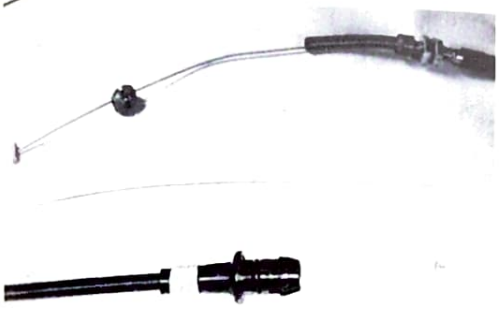
4. INSPECT VALVE SPRINGS

Check the squareness and check for damage, rust or collapsed coils. Measure free spring height and replace if less than that shown in specifications:

	Free length mm (in.)	Wire diameter mm (in.)
(1) Throttle valve	19.24 (0.7575)	0.71 (0.0280)
(2) Down shift plug	39.71 (1.5634)	1.19 (0.0469)
(3) Secondary regulator valve	71.27 (2.8059)	1.93 (0.0760)

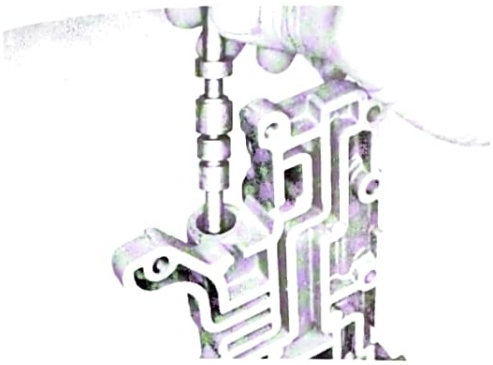
5. INSPECT THROTTLE CAM

Check each part for wear or damage.



6. INSPECT THROTTLE CABLE

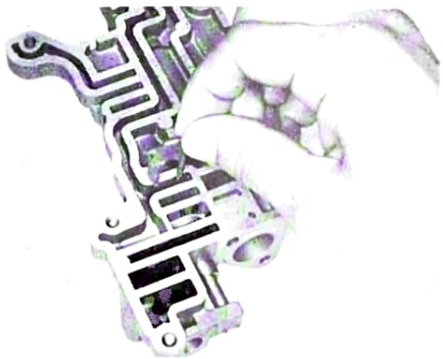
Check wire, rubber boots and end fittings for fraying, wear or damage.



ASSEMBLY OF UPPER FRONT VALVE BODY (See illustration on page 10-98)

GENERAL ASSEMBLY NOTES:

Make sure that all parts are perfectly clean and air dried before assembly. Lightly lubricate sliding surfaces on each valve with ATF just before inserting in the valve body. All other parts are assembled dry to prevent contamination with shop dust. Make sure that workbench and hands are clean.

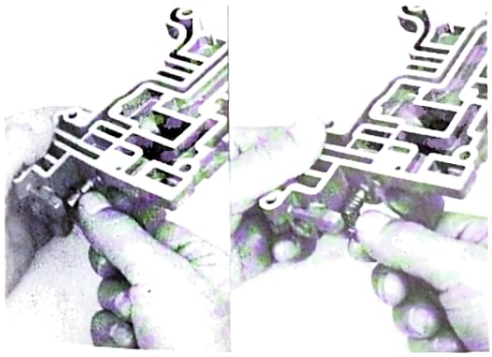


1. INSERT THROTTLE VALVE IN BORE

Note direction indicated in the figure. Make sure that the valve is inserted fully into bore.

2. INSTALL THROTTLE VALVE RETAINER

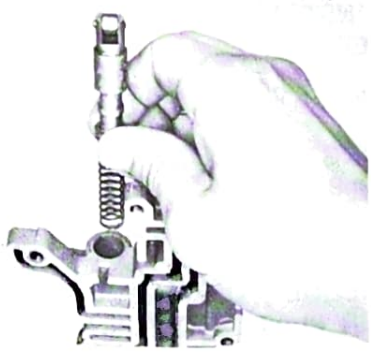
Coat clip with petroleum jelly to keep it in place. Note position of tabs in the figure. Slip retainer into place in the valve body.



3. INSTALL E-RING SHIMS AND SMALL SPRING ON THROTTLE VALVE SHAFT

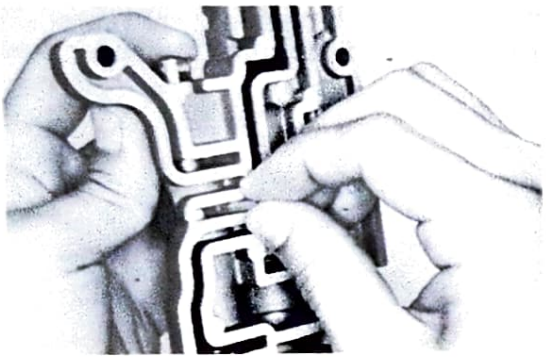
(a) Install same number of shims as were removed during disassembly.

(b) Slip spring over end of valve shaft. Compress and slide into place.



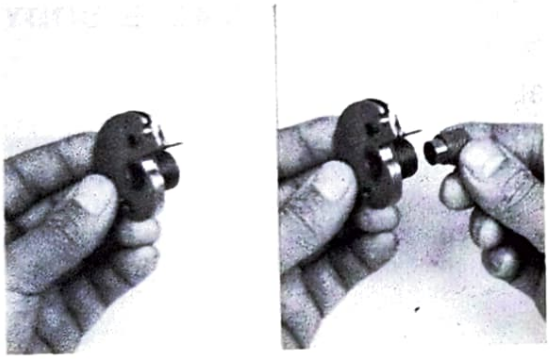
4. INSERT SPRING AND DOWN-SHIFT PLUG INTO BORE

In other end of throttle valve bore, insert spring first, then down-shift plug.



5. **TEMPORARILY INSTALL RETAINER OF CUT-BACK PLUG TO HOLD DOWN-SHIFT PLUG IN PLACE**

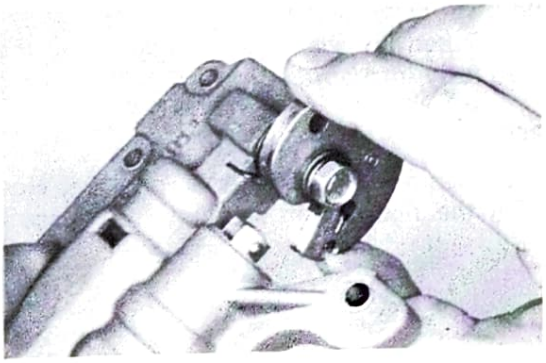
Push down-shift plug into the valve body and temporarily install retainer.



6. **ASSEMBLE THROTTLE CAM**

(a) Install the spring with hook through the hole in the cam.

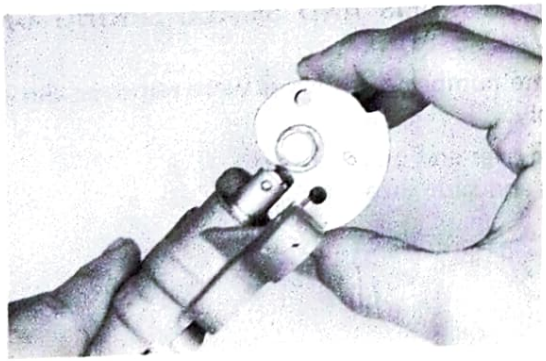
(b) Insert the sleeve through one side of the cam.



7. **INSTALL CAM ASSEMBLY ON UPPER FRONT VALVE BODY**

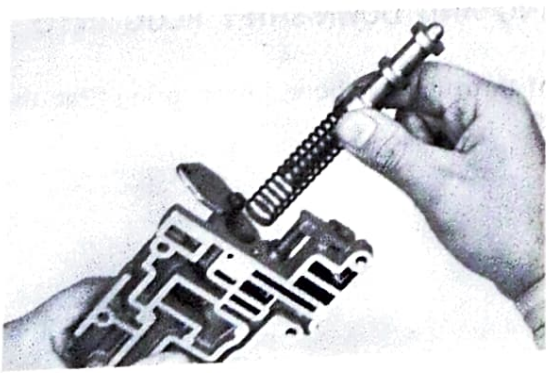
Start bolt threads into the valve body. Hook the spring onto the valve body. Check position of the spring ends with photo. Tighten bolt.

Torque: 0.6 – 0.9 kg-m (53 – 78 in.-lb)



8. **REMOVE TEMPORARILY INSTALLED RETAINER**

Push in down-shift plug and remove temporarily installed retainer. Make sure the roller or plug follows the smaller portion of the cam (flat edge surface).



9. **PARTIALLY INSTALL SECONDARY REGULATOR VALVE COVER PLATE**

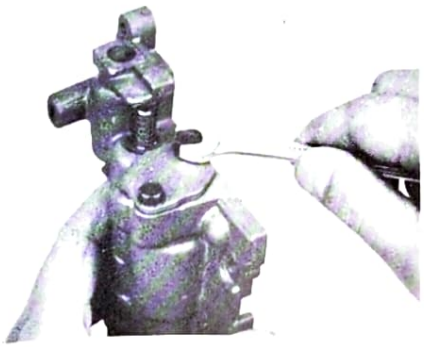
Install the plate with one bolt finger tight.

10. **INSERT SPRING AND SECONDARY REGULATOR VALVE INTO BORE**

Insert the spring first, then valve with smaller end first.

11. **COMPRESS REGULATOR VALVE SPRING AND SWING COVER PLATE INTO PLACE**

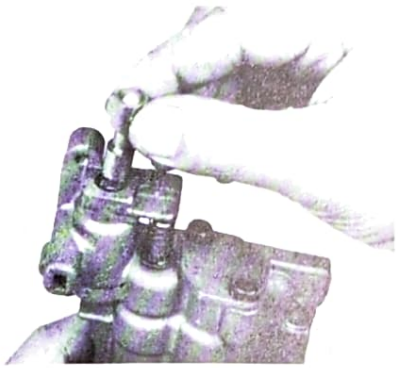
Cover plate will then hold valve in the body.



12. INSTALL SECOND BOLT IN COVER PLATE AND TIGHTEN BOTH BOLTS

Tighten bolts.

Torque: 0.6 – 0.7 kg-m (53 – 78 in.-lb)



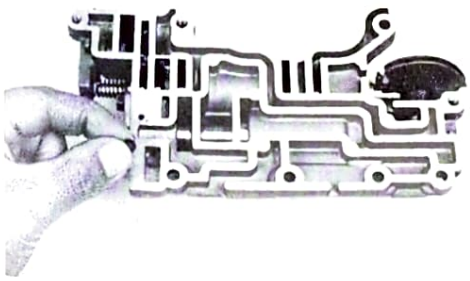
13. INSERT CUT-BACK VALVE AND PLUG INTO BORE

Install valve with smaller end first. Install the plug. Push fully into bore.

14. INSTALL CUT-BACK VALVE RETAINER

Coat with petroleum jelly to keep in place. Insert in place as shown.

NOTE: One check ball left over will be installed later, as the bodies are assembled.

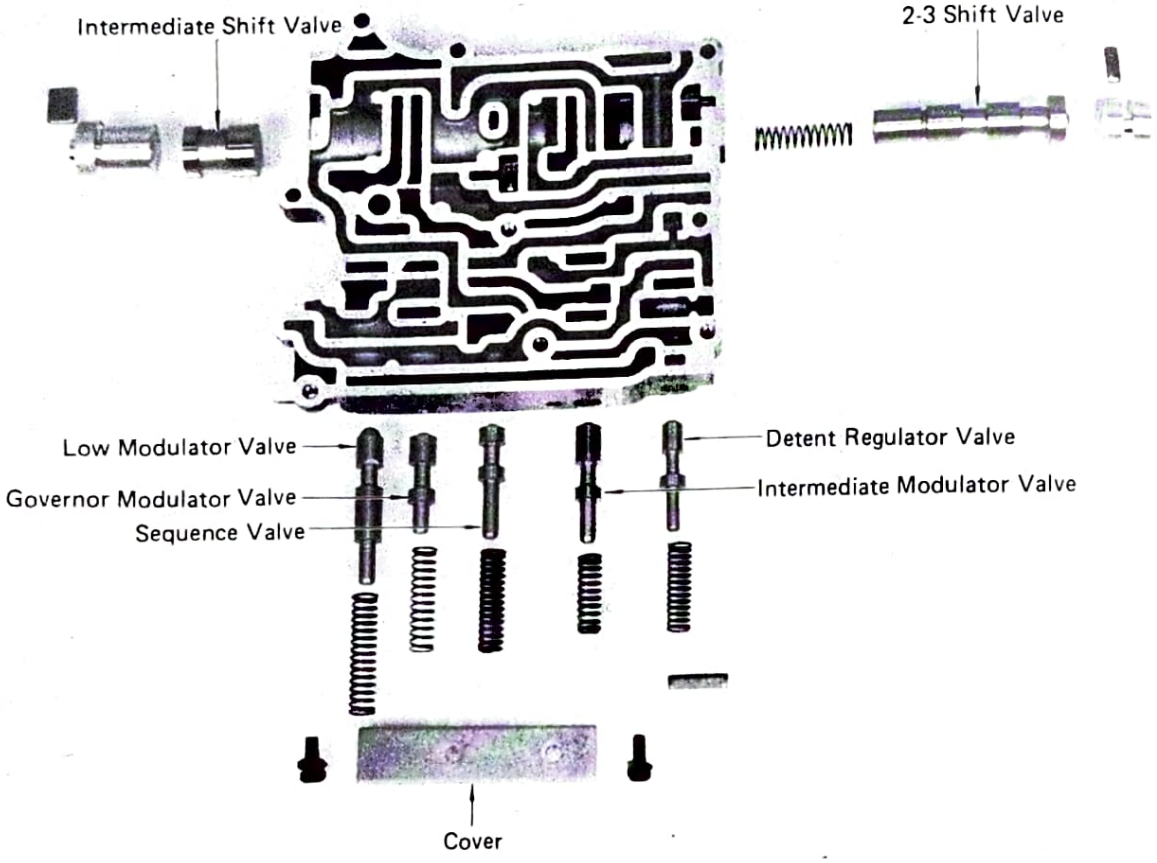


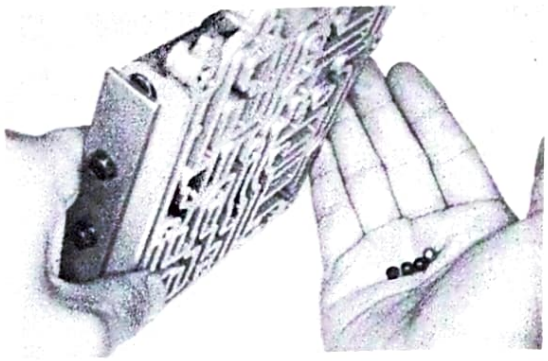
15. INSTALL RUBBER CHECK BALL IN UPPER FRONT VALVE BODY

Drop rubber check ball in location shown in the figure.

For assembly of valve body, see page 10-111.

UPPER REAR VALVE BODY

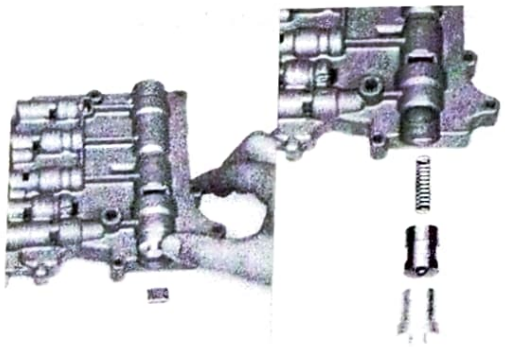




DISASSEMBLY OF UPPER REAR VALVE BODY

1. **TURN VALVE BODY OVER AND CATCH CHECK BALLS**

   NOTE: Three rubber balls and one steel ball.

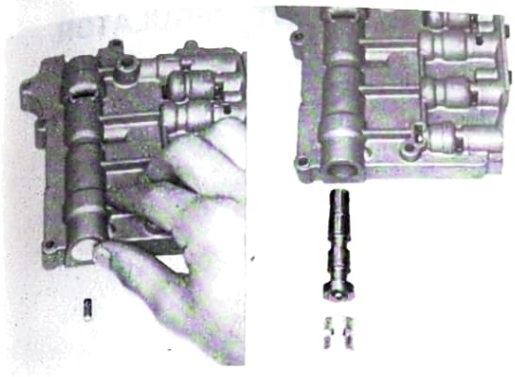


2. **REMOVE INTERMEDIATE SHIFT VALVE RETAINER**

   With valve body still turned over, push in on the valve and the retainer will drop out.

3. **REMOVE PLUG, INTERMEDIATE SHIFT VALVE AND SPRING**

   Tilt body and allow to slide out. Keep the spring with the valve.

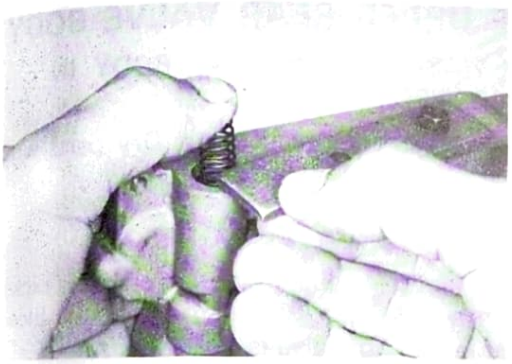


4. REMOVE 2-3 SHIFT VALVE RETAINER

Move plug back-and-forth and allow the retainer to fall out.

5. REMOVE PLUG AND 2-3 SHIFT VALVE

Tilt body and allow to slide out.



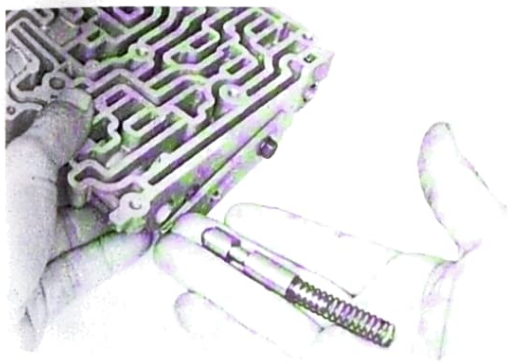
6. REMOVE ONE BOLT FROM VALVE BODY SIDE COVER

Remove the bolt closer to the middle of the cover and slightly loosen the other bolt.

7. SLIGHTLY ROTATE COVER

(a) Rotate the cover until the low modulator valve spring can be seen.

(b) Hold hand over the spring.



8. REMOVE SPRING AND LOW MODULATOR VALVE

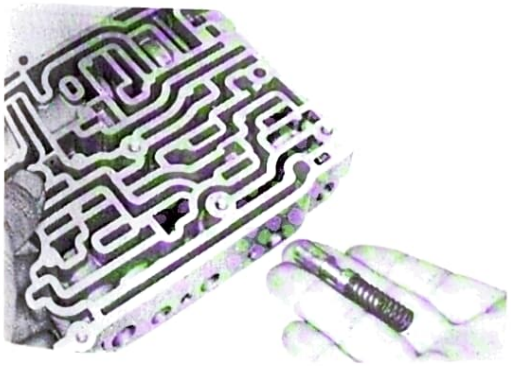
Lift out the spring and tilt body to remove the low modulator valve. Keep the spring with the valve.

9. ROTATE COVER FURTHER AND REMOVE SPRING AND GOVERNOR MODULATOR VALVE

Keep the spring with the valve.

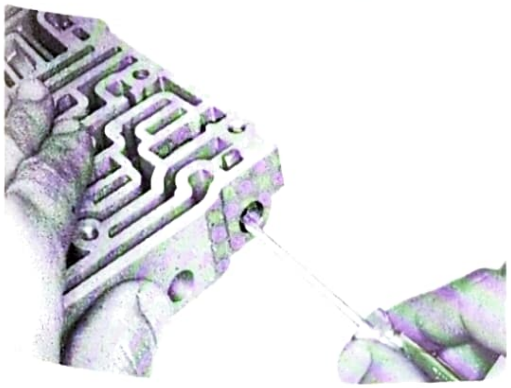
10. ROTATE COVER FURTHER AND REMOVE SPRING AND REVERSE SEQUENCE VALVE

Keep the spring with the valve.



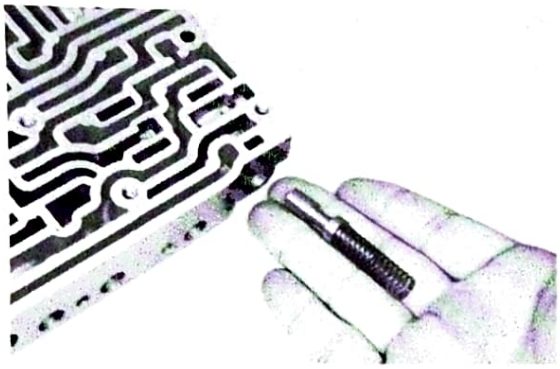
11. REMOVE COVER PLATE, SPRING AND INTERMEDIATE MODULATOR VALVE

Keep the spring with the valve.



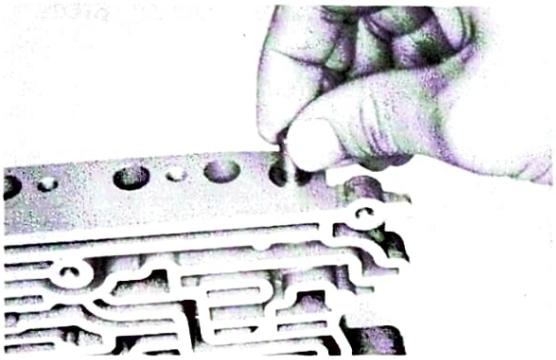
12. REMOVE DETENT REGULATOR VALVE RETAINER

Lift out with a screwdriver. Be careful not to damage the spring or valve body.



13. **REMOVE SPRING AND DETENT REGULATOR VALVE**

Keep the spring with the valve.



INSPECTION OF UPPER REAR VALVE BODY

1. **THOROUGHLY WASH VALVES AND BODY IN NEW, CLEAN SOLVENT**

Be careful not to scratch or nick parts. Dry parts with compressed air.

2. **INSPECT VALVES AND VALVE BORES**

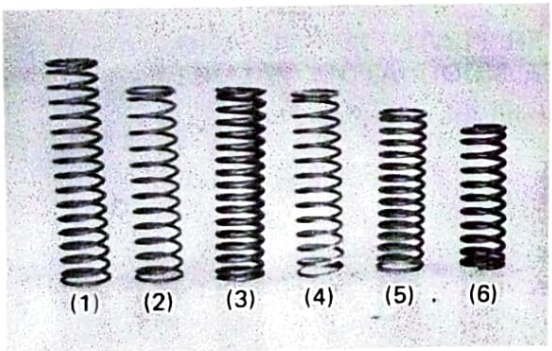
Check for wear, rust, rough spots, cracks, nicks, deformation or other damage. Make sure that the bleed hole in the end of modulator valve is clear.

3. **INSPECT FACES, OIL HOLES AND PASSAGES IN VALVE BODY**

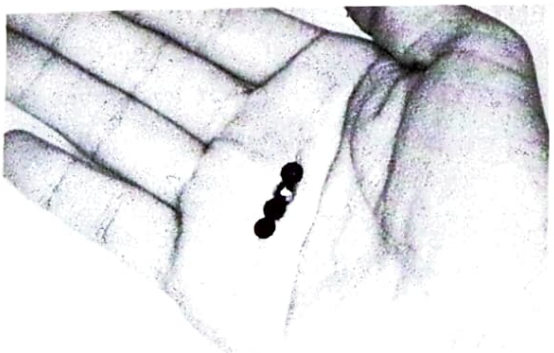
Check for scratches, clogging, obstruction or leakage between passages. (Also inspect old gasket for indications of leakage).

4. **INSPECT VALVE SPRINGS**

Check the squareness and check for damage, rust or collapsed coils. Measure free spring height and replace if less than that shown in specifications.



	Free length mm (in.)	Wire diameter mm (in.)
(1) Low coast modulator valve	42.35 (1.6673)	0.84 (0.0331)
(2) Sequence valve	37.55 (1.4783)	1.17 (0.0461)
(3) Governor modulator valve	36.07 (1.4201)	0.71 (0.0280)
(4) 2-3 shift valve	35.10 (1.3819)	0.76 (0.0299)
(5) Detent regulator valve	29.93 (1.1783)	0.90 (0.0354)
(6) Intermediate modulator valve	27.26 (1.0732)	1.10 (0.0433)



5. **INSPECT CHECK BALLS**

Check rubber balls and one steel ball for wear, damage or improper seating, indicated by a wear line.

NOTE: Three rubber balls and one steel ball.

ASSEMBLY OF UPPER REAR VALVE BODY (See illustration on page 10-106)

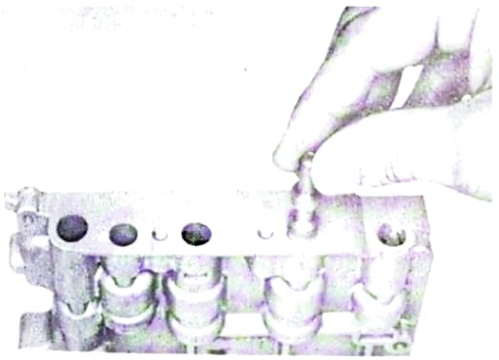
GENERAL ASSEMBLY NOTES:

Make sure that all parts are perfectly clean and air dried before assembly. Lightly lubricate sliding surfaces on each valve with ATF just before inserting in the valve body. All other parts are assembled dry to prevent contamination with shop dust. Make sure that the workbench and hands are clean.

1. INSTALL DETENT REGULATOR VALVE, SPRING AND RETAINER

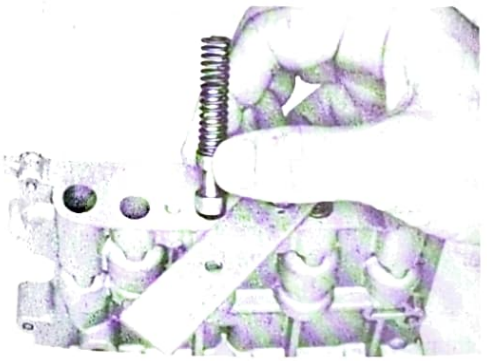
   Insert the valve (round end first) and spring into bore. Compress spring with wide-bladed screwdriver and slip retainer over the edge of the spring. Then use needle-nose pliers to compress spring and allow the retainer to fall into place.

   NOTE: Make sure that the retainer fully covers end of spring.



2. INSERT INTERMEDIATE MODULATOR VALVE AND SPRING INTO BORE

   Insert valve with round end first, and then insert the spring.

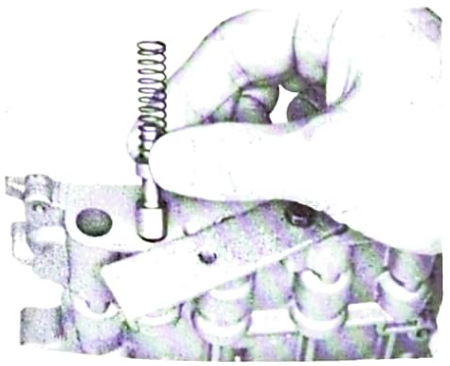


3. INSTALL VALVE BODY SIDE COVER WITH ONE BOLT

   Compress intermediate modulator spring and install end bolt finger tight.

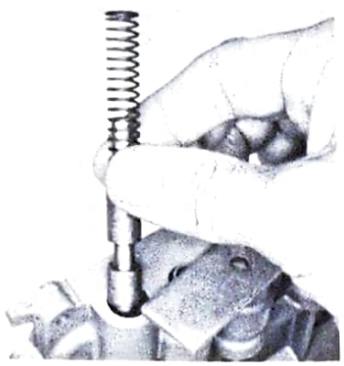
4. INSERT REVERSE SEQUENCE VALVE AND SPRING INTO BORE

   Swing side plate out of the way. Insert the valve with round end first, then insert the spring. Compress the spring and rotate the cover to hold it.



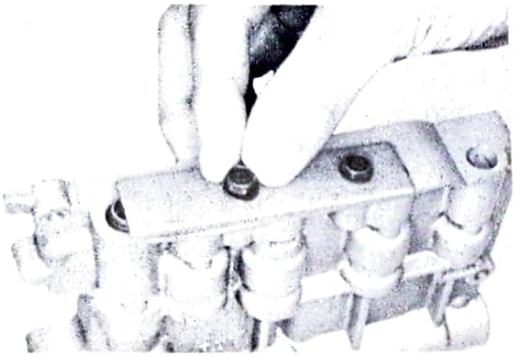
5. INSERT GOVERNOR MODULATOR VALVE AND SPRING INTO BORE

   Insert the valve with round end first, then insert the spring. Compress the spring and rotate the cover further to hold the spring.



6. **INSERT LOW MODULATOR VALVE AND SPRING INTO BORE**

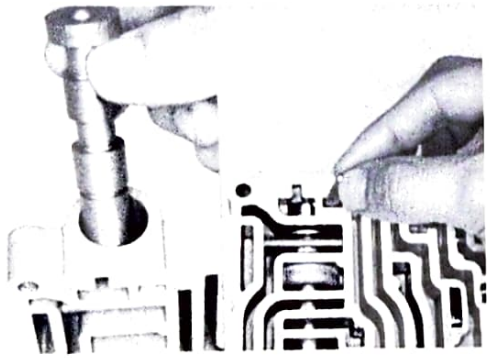
Insert the valve with round end first, then insert the spring. Compress the spring and swing cover over to hold it.



7. **POSITION COVER AND INSTALL SECOND BOLT**

Install second bolt, and tighten both bolts.

Torque: 0.5 – 0.6 kg-m (44 – 52 in.-lb)

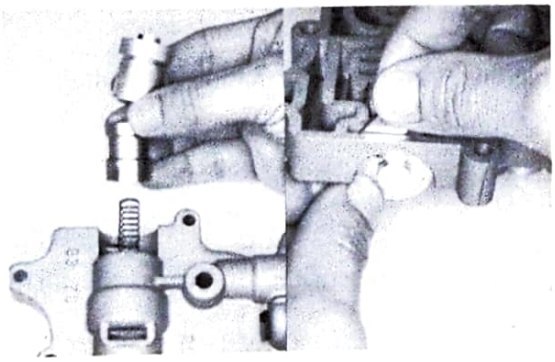


8. **INSERT 2-3 SHIFT VALVE AND PLUG INTO BORE**

Insert valve with smaller end first, and then insert plug.

9. **INSTALL INTERMEDIATE SHIFT VALVE RETAINER**

Compress plug and install retainer in the valve body.

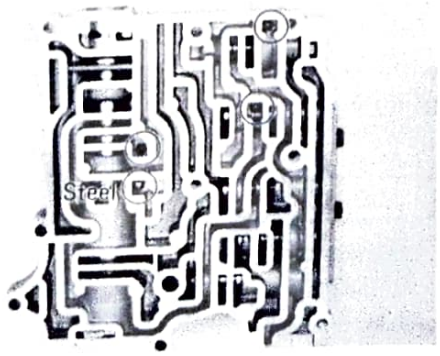


10. **INSERT SPRING, INTERMEDIATE SHIFT VALVE AND PLUG INTO BORE**

Install valve with rounded end up.

11. **INSTALL RETAINER OVER 2-3 SHIFT VALVE PLUG**

Insert the retainer through the valve body.



12. **INSTALL CHECK BALLS AS SHOWN**

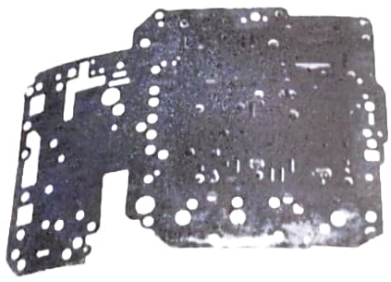
Install the steel ball.

The rubber balls are identical and may be installed in any other of the positions.

As for assembly of valve body, see page 10-111.

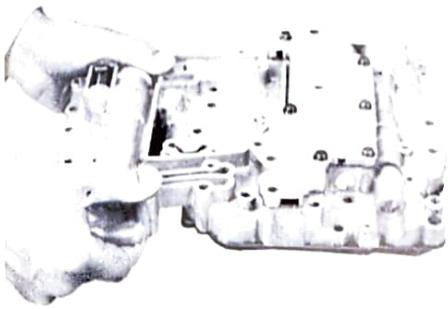
ASSEMBLY OF VALVE BODY

(See illustration on page 10-88)



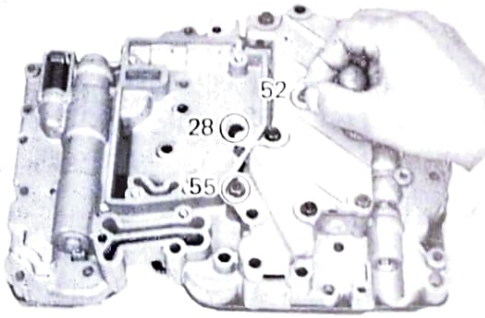
1. POSITION NEW GASKET ON UPPER REAR VALVE BODY

   Make sure the new gasket matches the old gasket before installation. Align the gasket at lower left corner.



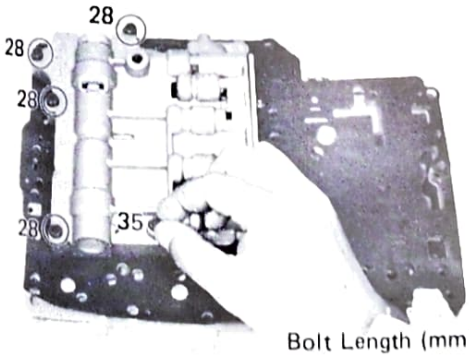
2. PLACE LOWER VALVE BODY WITH PLATE ON TOP OF UPPER REAR VALVE BODY

   Align left edge.



3. INSTALL THREE BOLTS IN LOWER VALVE BODY TO SECURE UPPER REAR VALVE BODY

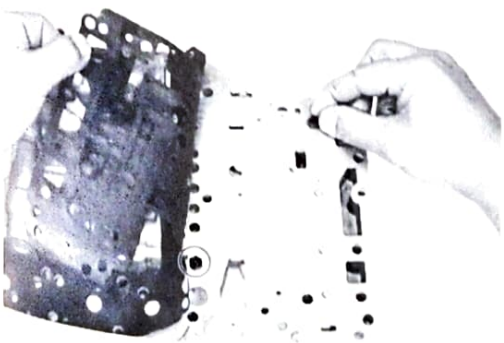
   Install three bolts indicated in figure. Tighten the bolts just barely finger tight.



Bolt Length (mm)

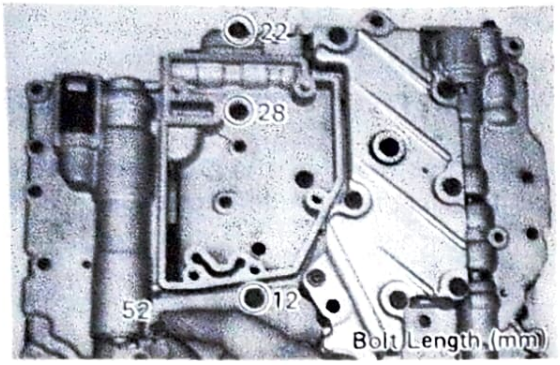
4. TURN VALVE BODY ASSEMBLY OVER, CHECK GASKET ALIGNMENT AND INSTALL FIVE BOLTS IN UPPER REAR VALVE

   Make sure that the gasket is perfectly aligned. Install five bolts finger tight. Make sure that the gaskets are still aligned.



5. REMOVE TEMPORARILY INSTALLED BOLTS FROM PLATE

   Carefully pull back gasket and remove two bolts.



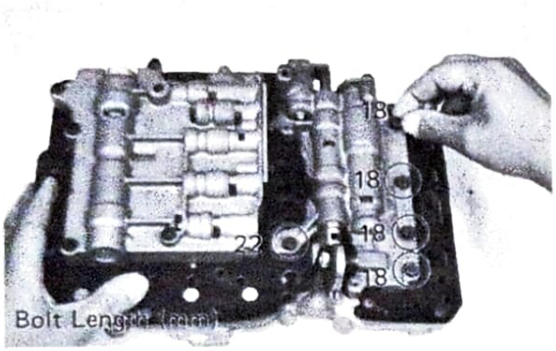
6. **PLACE LOWER AND UPPER REAR VALVE BODY ASSEMBLY ON TOP OF UPPER FRONT VALVE BODY**

Align bolt holes.

7. **PLACE SMALL COVER AND INSTALL FOUR BOLTS FINGER TIGHT**

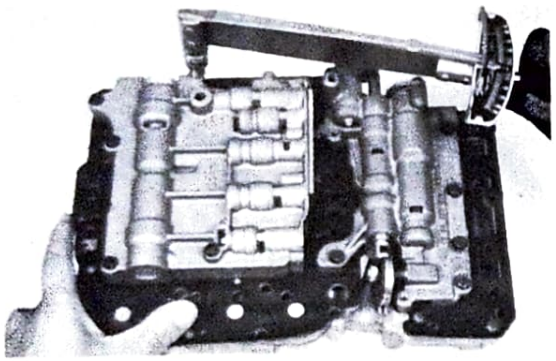
Finger tighten the bolts in accordance with the bolt length indicated in the figure.

CAUTION: Do not tighten these bolts until the installation of other bolts.



8. **TURN VALVE BODY ASSEMBLY OVER AND INSTALL FIVE BOLTS**

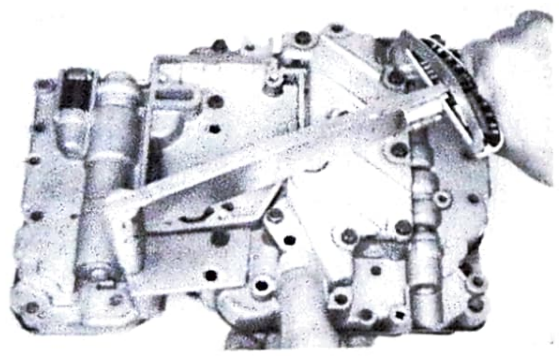
Finger tighten the bolts in accordance with the bolt length indicated in the figure.



9. **TIGHTEN BOLTS IN UPPER FRONT AND REAR VALVE BODIES**

Recheck alignment of gaskets. Tighten bolts.

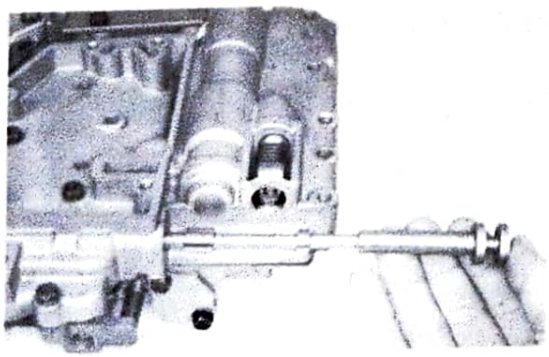
Torque: 0.5 – 0.6 kg-m (44 – 52 in.-lb)



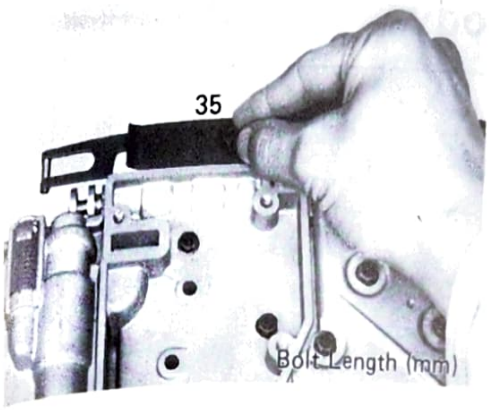
10. **TURN OVER VALVE BODY ASSEMBLY AND TIGHTEN BOLTS IN LOWER VALVE BODY**

Tighten bolts.

Torque: 0.5 – 0.6 kg-m (44 – 52 in.-lb)



11. **INSERT MANUAL VALVE INTO BORE**

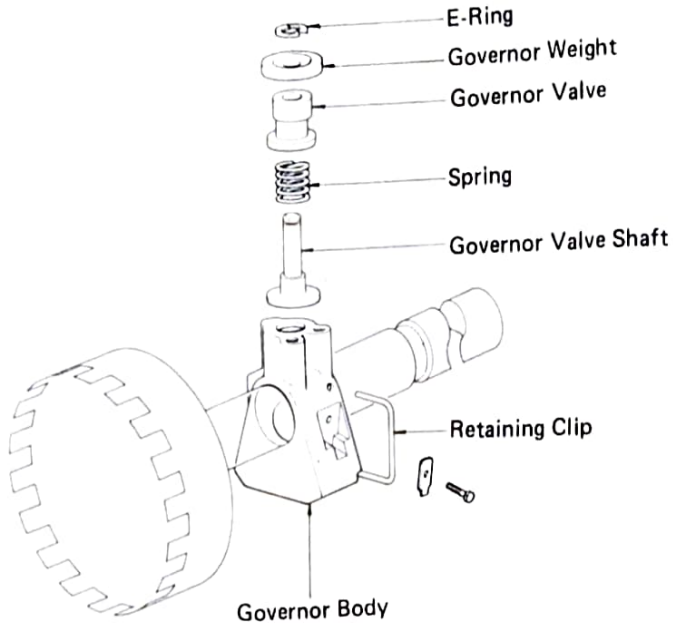


12. INSTALL DETENT SPRING

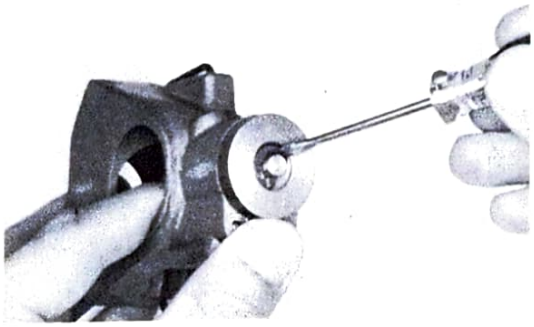
Tighten bolts.

Torque: 0.5 – 0.6 kg-m (44 – 52 in.-lb)

Governor Body

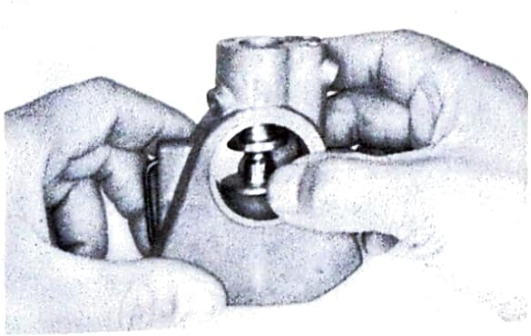


DISASSEMBLY OF GOVERNOR BODY



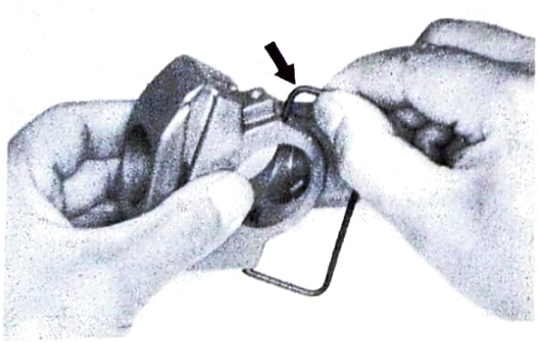
1. REMOVE E-RING AND GOVERNOR WEIGHT

Compress the spring by pushing up on the shaft and down on the weight. Remove E-ring with a screwdriver. Lift off governor weight.



2. REMOVE GOVERNOR VALVE

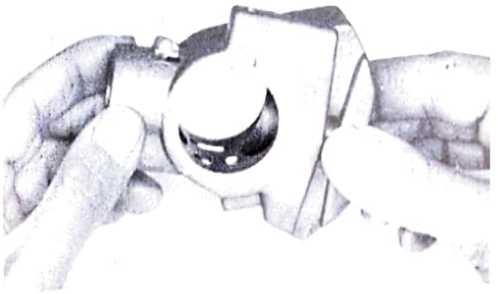
Slide down through the bore.



3. REMOVE RETAINING CLIP

Remove the end indicated by arrow first being careful not to scratch the governor body.

INSPECTION OF GOVERNOR BODY



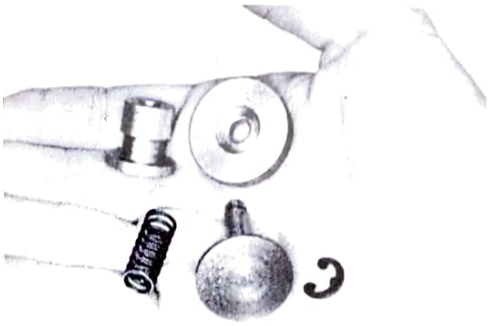
1. THOROUGHLY WASH ALL PARTS IN CLEAN SOLVENT

   Use only clean solvent. Dry parts with compressed air.

2. INSPECT GOVERNOR BODY

   (a) Check valve bore and body for wear or cracks.

   (b) Check oil hole and passage for clogging.



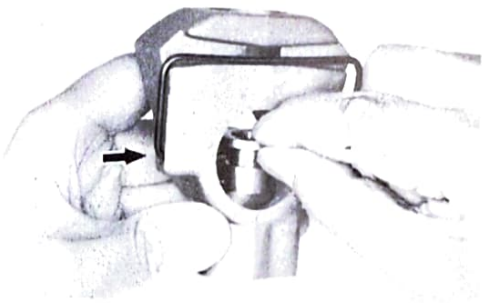
3. INSPECT GOVERNOR VALVE, SHAFT AND SPRING

   (a) Check for wear, rust or damage.

   (b) Insert valve in body and rotate to see that it slides smoothly.

ASSEMBLY OF GOVERNOR BODY

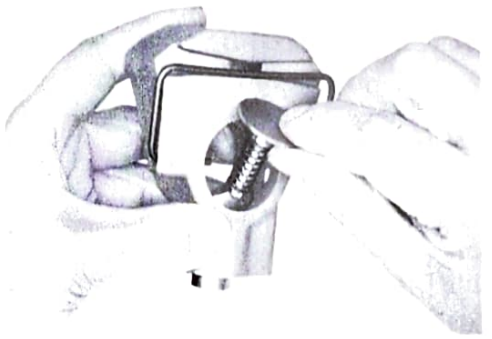
(See illustration on page 10-105)



1. INSTALL RETAINING CLIP AND GOVERNOR VALVE

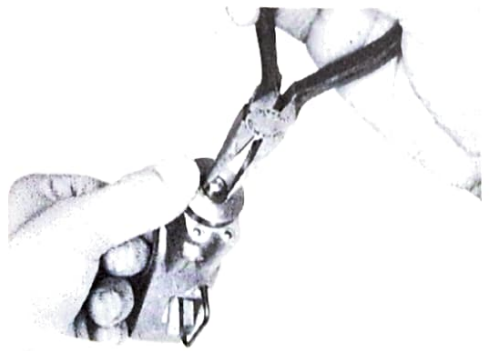
   (a) Install the clip end indicated by arrow being careful not to scratch the governor body.

   (b) Slide down the governor valve through the bore.



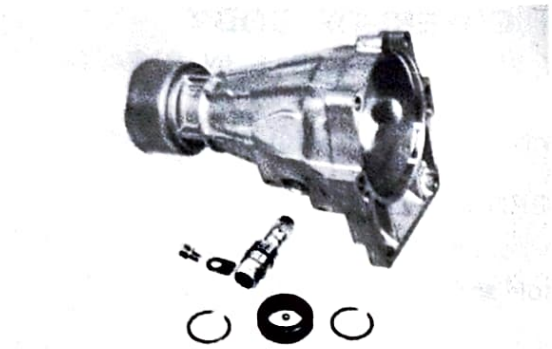
2. INSTALL SHAFT AND SPRING

   Slide down through the bore.



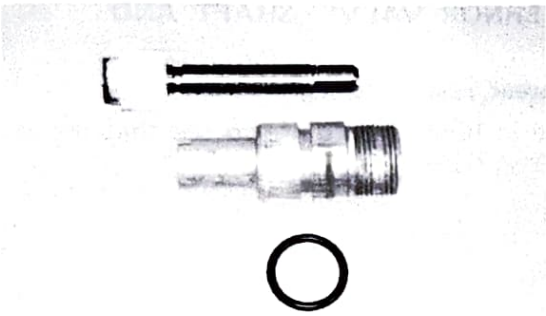
3. INSTALL GOVERNOR WEIGHT AND E-RING ON SHAFT

   Compress spring, and install E-ring on the shaft with needle-nose pliers. Make sure that it is fully seated in the groove.



Speedometer Gear and Extension Housing

NOTE: Parts were disassembled during initial transmission disassembly.



INSPECTION OF SPEEDOMETER GEAR AND EXTENSION HOUSING

1. THOROUGHLY WASH PARTS IN CLEAN SOLVENT

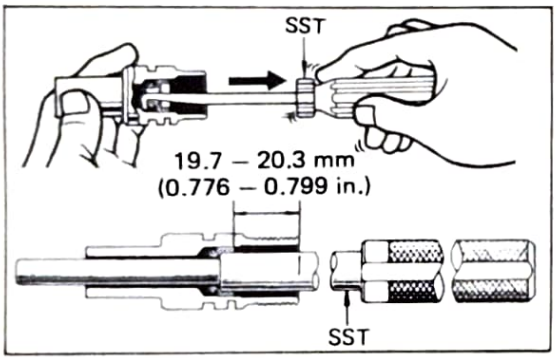
   If necessary, use a bristle brush to clean the housing. Dry all parts with compressed air.

2. INSPECT SPEEDOMETER DRIVE GEAR AND DRIVEN GEAR

   (a) Check gear teeth for wear or damage.

   (b) Check gear shaft, oil seal and O-ring for wear or damage.

   If the oil seal is worn or damaged, replace it.



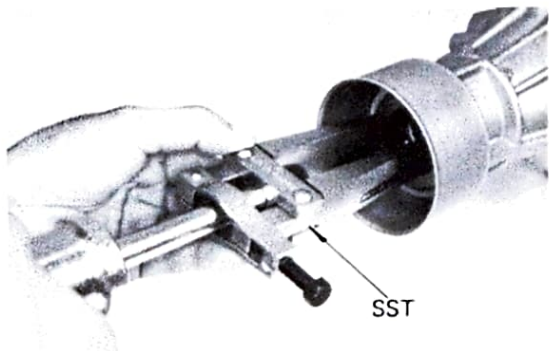
3. IF NECESSARY REPLACE OIL SEAL

   (a) Using a hook*, remove the seal.

   *SST 09921-00010 or Commercial tool

   (b) Using a driver*, install the new seal.

   *SST 09201-60011 or Commercial driver



4. INSPECT EXTENSION HOUSING

   (a) Check the extension housing for damage or cracks.

   (b) Check the housing oil seal for wear or damage.

5. IF NECESSARY, REPLACE OIL SEAL AND DUST SEAL

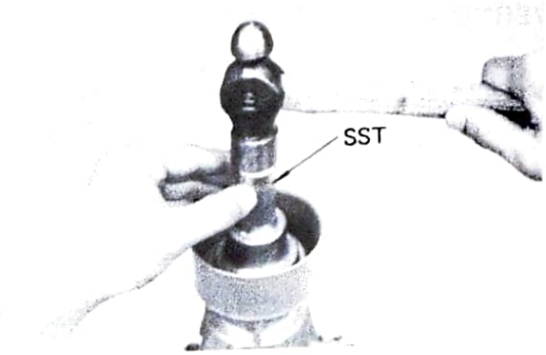
   (a) Using oil seal puller*, remove seals. If both seals do not come out together, remove the oil seal with a second pull. Discard seals.

   *SST 09308-00010 or Commercial puller, or SST 09308-10010 with extension housing installed

   (b) Before installation, coat new oil seal with MP grease and soak dust seal in ATF. Install a new oil seal with cup side down and then a dust seal using a hammer and seal installation tool*.

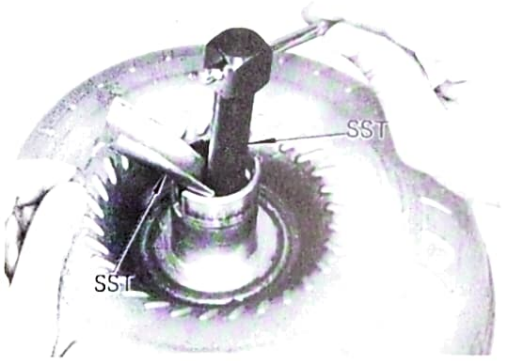
   *SST 09325-20010 or Commercial driver

   CAUTION: The dust seal end should be flush with the lip of extension housing.



Torque Converter

IMPORTANT NOTE: If the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flushed, using Toyota Transmission Cleaner.

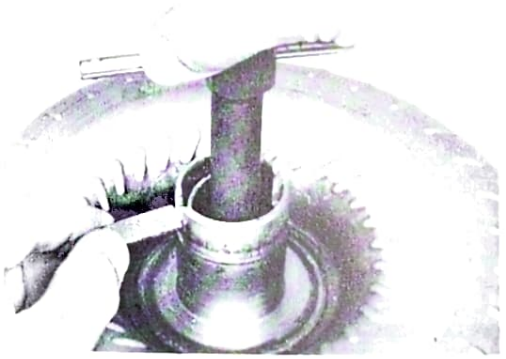


INSPECTION OF TORQUE CONVERTER

1. INSERT SST'S INTO END OF TORQUE CONVERTER

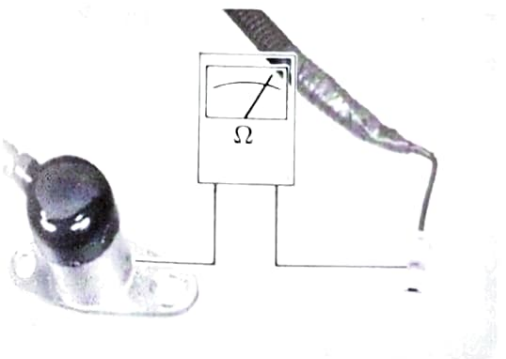
Insert turning tool in inner race of one-way clutch. Insert the stopper so that it fits in notch of the converter hub and other race of one-way clutch.

SST 09350-20010 or 00002-00223-01



2. TEST ONE-WAY CLUTCH

Clutch should lock when turned counterclockwise, and should rotate freely and smoothly clockwise. Less than 25 kg-cm (22 in.-lb) of torque should be required to rotate the clutch clockwise. If necessary, clean converter and retest the clutch. Replace the converter if clutch still fails the test.



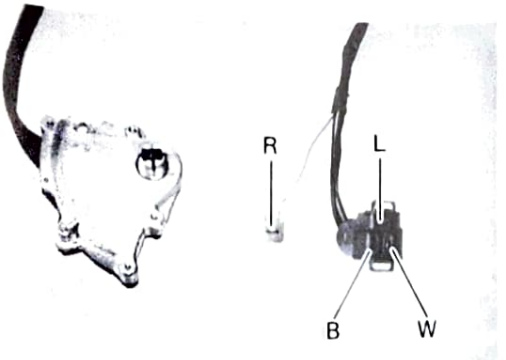
OD Solenoid and Neutral Start Switch

CAUTION: Do not clean the electrical parts with solvent. If dirty, wipe off with shop rags.

1. INSPECT OD SOLENOID

Check the resistance between terminals.

Standard resistance : about 13 ohms



2. INSPECT NEUTRAL START SWITCH

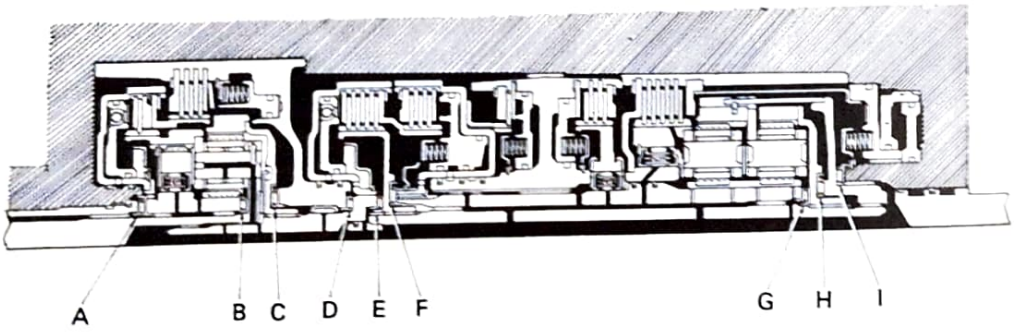
(a) Make sure that there is continuity between B and W terminals in P and N range.

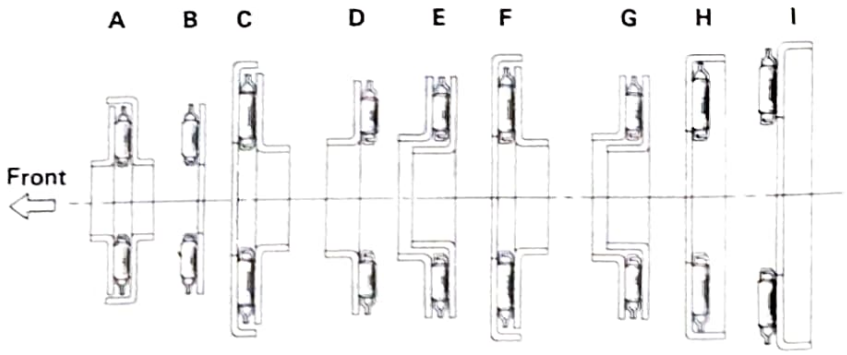
(b) Make sure that there is continuity between L and R terminals in remaining ranges.

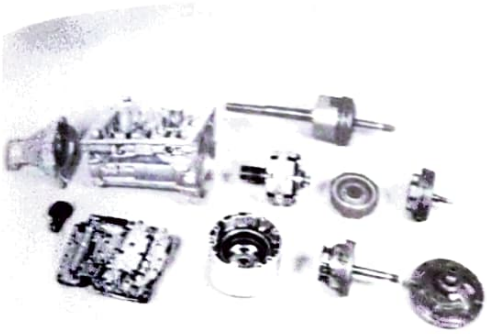
ASSEMBLY OF TRANSMISSION

GENERAL ASSEMBLY NOTE

1. The automatic transmission is composed of highly precision-finished parts, necessitating careful inspection before assembling them because even a small nick could cause fluid leakage or affect performance.
2. Do not use adhesive cements on gaskets and similar parts.
3. Before assembling new clutch discs, soak them in automatic transmission fluid for at least two hours.
4. When assembling the transmission, be sure to use new gaskets and O-rings.
5. Apply automatic transmission fluid on sliding or rotating surfaces of the parts before assembly.
6. Dry all parts by blowing with compressed air. Never use shop rags.
7. Use petroleum jelly to keep small parts in their places.
8. Be sure to install thrust bearings and races in correct direction and position.

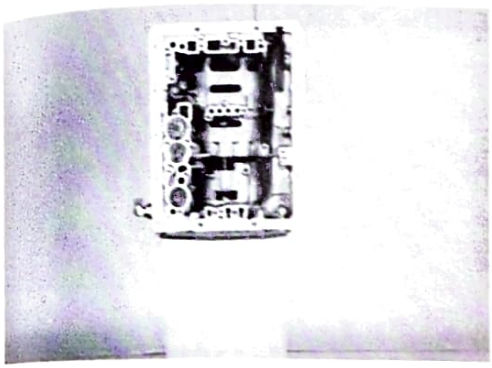






1. CHECK EACH COMPONENT GROUP CONDITION

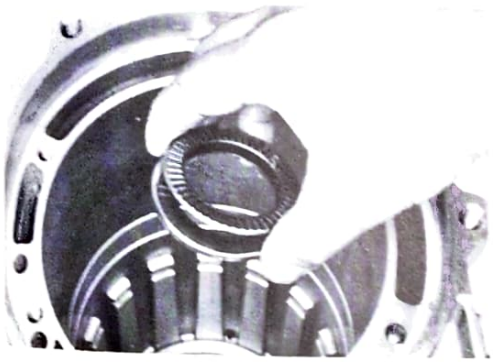
Before assembly, make sure again that all component groups are assembled correctly.



2. PLACE TRANSMISSION CASE ON CYLINDER

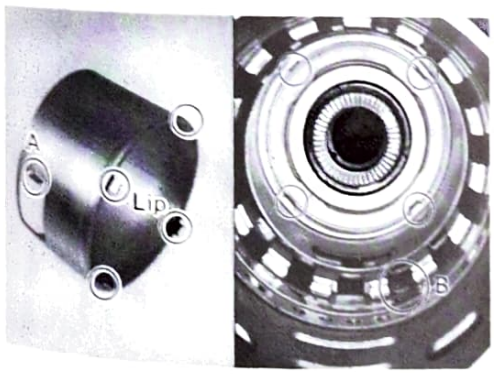
Place the transmission case on a stand in the shape of cylinder for efficient work.

CAUTION: Place shop rags between the case and stand to avoid spoiling case.



3. INSTALL THRUST WASHER AND BEARING

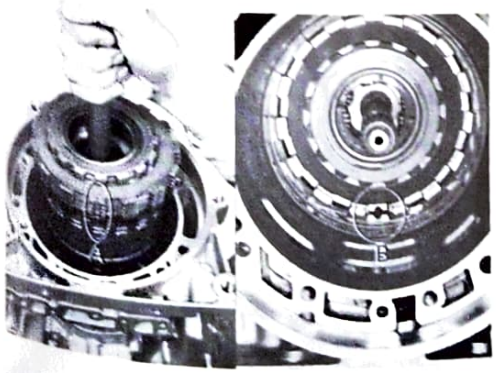
NOTE: Install thrust washer facing cup side downward.



4. INSTALL APPLY TUBE IN CASE

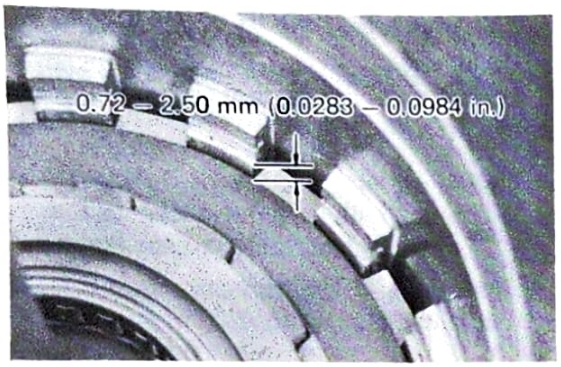
Install apply tube aligning its locking tab (part A) with part B of the case.

NOTE: Make sure that the lips of tube end are completely inserted into the case.



5. PARTIALLY INSERT OUTPUT SHAFT ASSEMBLY INTO CASE

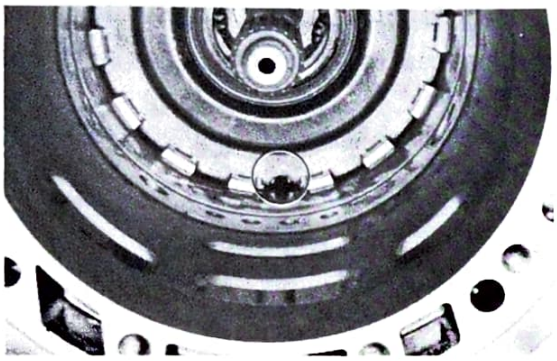
Align opening notch (part A) of clutch plates with the slot (part B) of case.



6. CHECK CLUTCH PACK CLEARANCE

With case in upright position, make sure that the clutch disc is lower than ledge below snap ring groove.

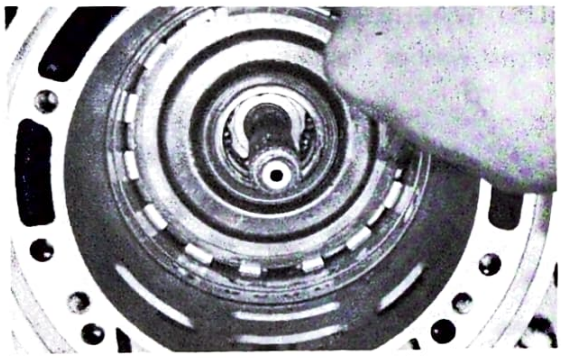
If clutch disc is not lower than ledge, components may be misassembled.



7. INSTALL REACTION PLATE

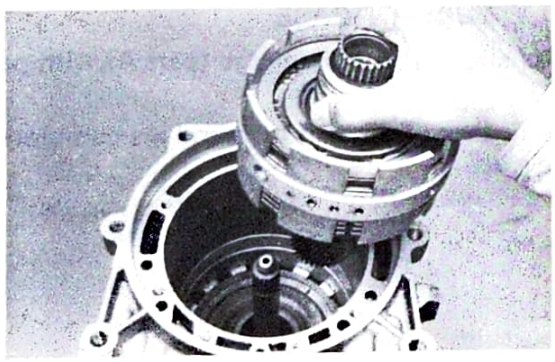
Position notched tooth of reaction plate toward valve body side of the case. Push into place.

NOTE: The reaction plate is correctly installed if the snap ring groove is fully visible.



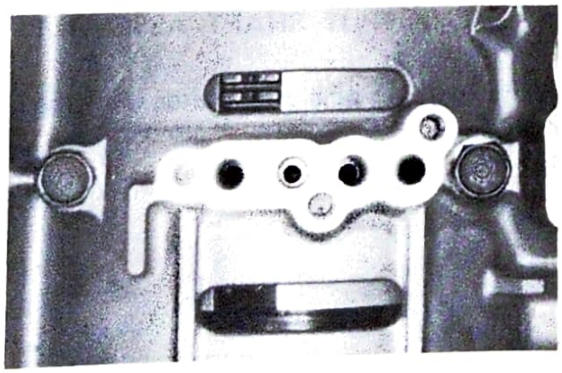
8. INSTALL SNAP RING

Use a large screwdriver to compress the snap ring. Push it into place by hand. Work around the case. Visually check to make sure that the ring is fully seated. Make sure that the ends of the snap ring are between lugs.



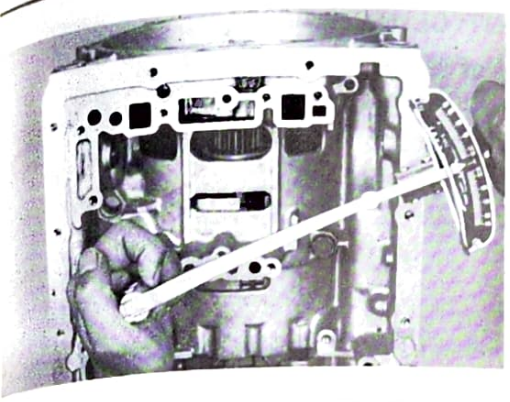
9. PUSH CENTER SUPPORT ASSEMBLY INTO CASE

Before installation, double-check that the brake No. 2 hub is fully meshed with its discs. While pulling on the sun gear shaft, push the center support assembly into the case.



10. INSTALL TWO CENTER SUPPORT BOLTS WITH WAVE WASHERS

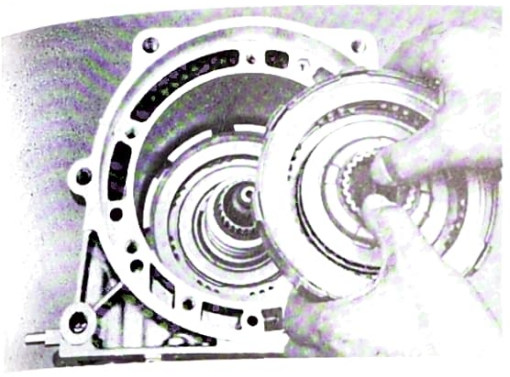
Align the center support with holes in case and install two bolts finger tight.



11. TIGHTEN TWO CENTER SUPPORT BOLTS

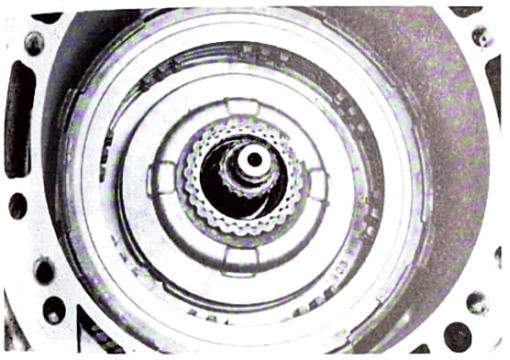
Tighten bolts alternately in 70 kg-cm (61 in.-lb) increments.

Torque: 2.4 – 2.8 kg-m (18 – 20 ft-lb)



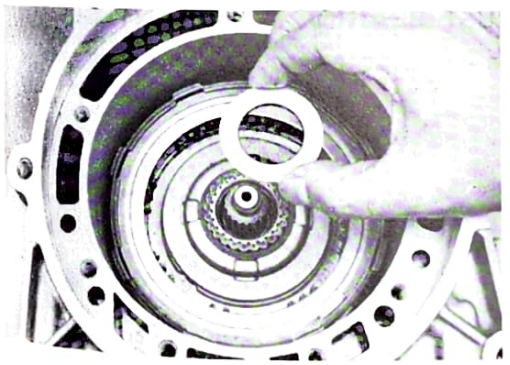
12. INSTALL REAR CLUTCH INTO CASE

Rotate clutch to mesh the hub with the center support.



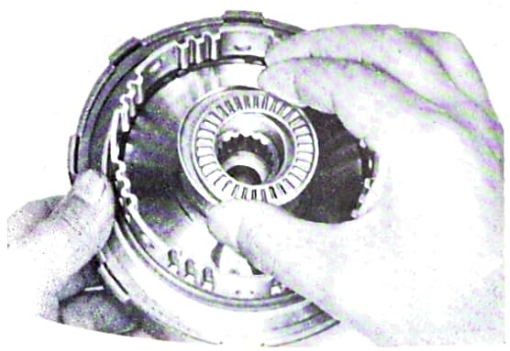
13. CHECK FOR CORRECT INSTALLATION OF REAR CLUTCH

If rear clutch is fully meshed with the center support, the splined center of the clutch will be flush with the end of the sun gear shaft.



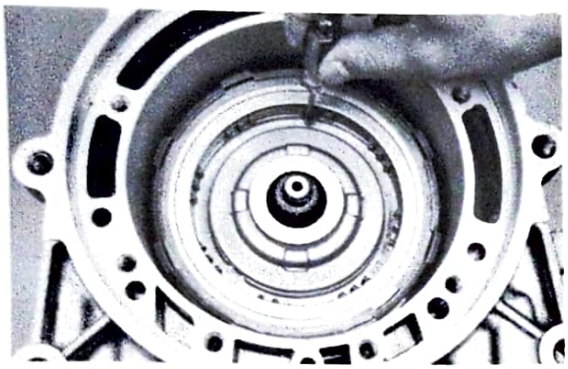
14. INSTALL NEEDLE BEARING RACE OVER SPLINED END OF REAR CLUTCH IN CASE

Coat parts with petroleum jelly to keep them in place. Put lip of race toward the rear clutch. Press into place.



15. INSTALL THRUST BEARING AND RACE ON FRONT CLUTCH

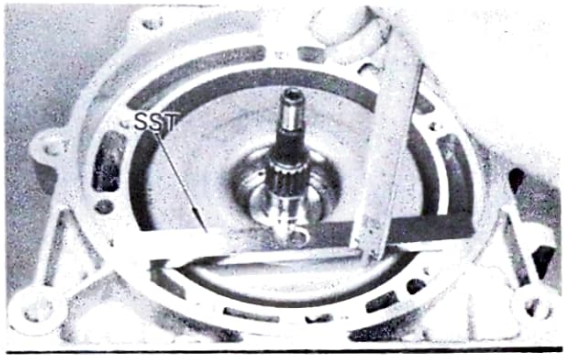
Coat parts with petroleum jelly to keep them in place. Put lip of race outward. Press into place.



16. INSTALL FRONT CLUTCH ASSEMBLY INTO CASE

Complete flukes of rear clutch discs and mesh them with front clutch hub. Push front clutch assembly into the case.

CAUTION: Be careful the thrust bearing does not fall out.



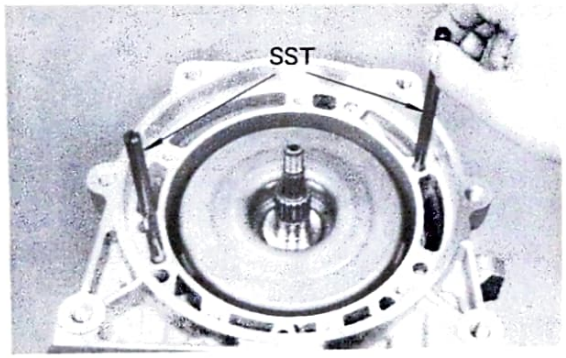
17. CHECK CORRECT INSTALLATION OF FRONT CLUTCH

Set SST on transmission case as shown in the figure. Measure the distance between top surface of SST and front clutch assembly.

If the distance corresponds to the specification, front clutch will mesh completely with rear clutch.

SST 09350-20013

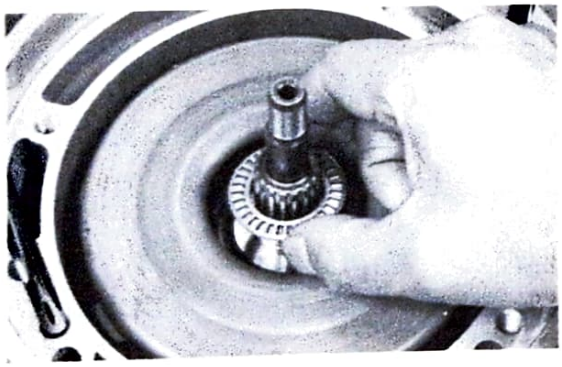
Height: Measured value minus SST width = Approx. 2 mm (0.08 in.)



18. INSTALL SST ON CASE

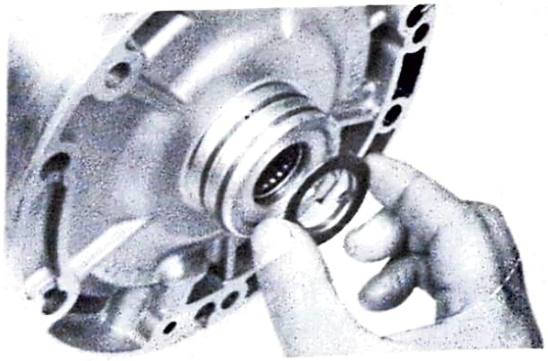
Finger tighten SST as guide pin on transmission case.

SST 09350-20013



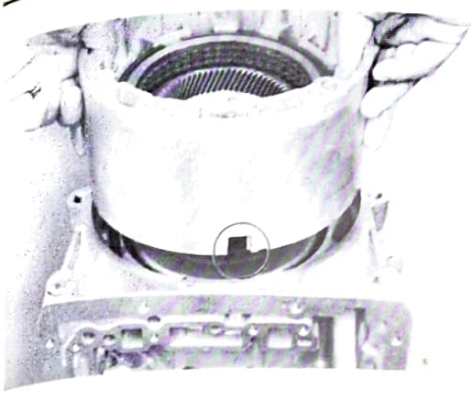
19. INSTALL THRUST BEARING ON FRONT CLUTCH

Coat thrust bearing with petroleum jelly and set into place.



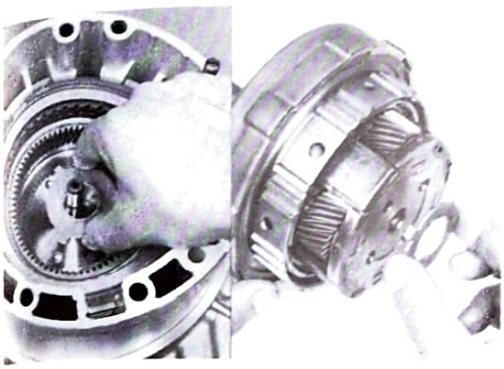
20. INSTALL THRUST WASHER ON OD CASE END

Coat thrust washer with petroleum jelly and set into place facing lip side toward OD case.



21. INSERT OD CASE INTO TRANSMISSION CASE

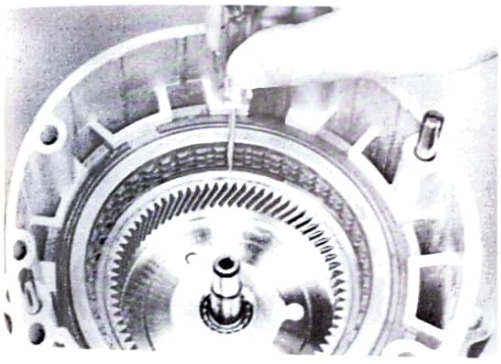
Set the opening notch of OD case in the position indicated in the figure and insert gently through two guide pins.



22. INSTALL TWO THRUST WASHERS

Coat thrust washers with petroleum jelly. Install one thrust washer on OD case and the other one on OD clutch.

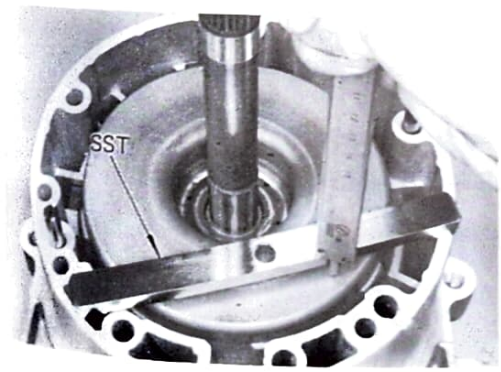
NOTE: The lugs of washers should be inserted in holes.



23. INSTALL OD CLUTCH IN CASE

Complete flukes of discs in the OD case. Align the flukes with slots of OD clutch and press OD clutch into OD case.

NOTE: Be careful the thrust washer of OD clutch does not fall out.

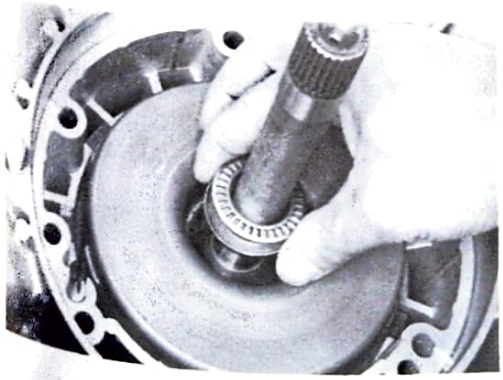


24. CHECK CORRECT INSTALLATION OF OD CLUTCH

Set SST on OD case as shown in the figure. Masure the distance between top durface of SST and OD clutch. If the distance corresponds to the specification, OD clutch is installed correctly.

SST 09350-20013

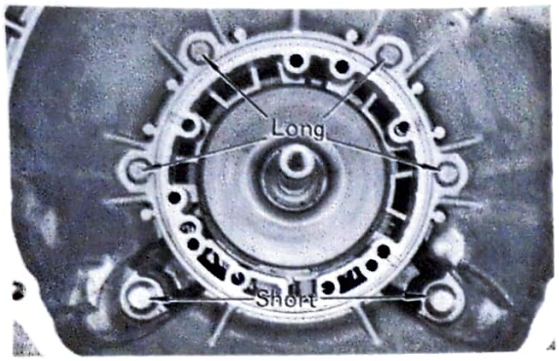
Height: Measured value minus SST width = Approx. 2 mm (0.08 in.)



25. INSTALL O-RING ON OD CASE

26. INSTALL THRUST WASHER AND BEARING ON OD CLUTCH

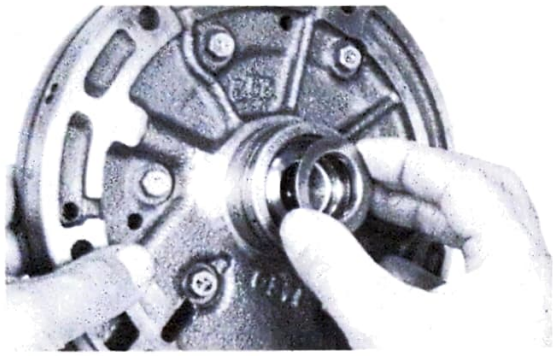
Coat thrust washer with petroleum jelly. Install thrust washer facing lip side outward together with the bearing.



27. INSTALL BELL HOUSING

Install two short bolts and four long bolts and tighten them.

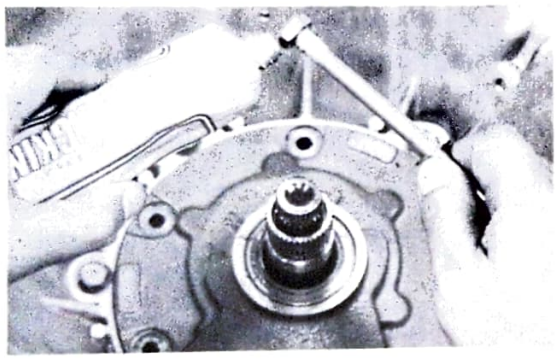
Torque: Short bolts 4.8 – 6.8 kg-m (35 – 49 ft-lb)
Long bolts 2.7 – 4.2 kg-m (20 – 30 ft-lb)



28. INSTALL FRONT OIL PUMP

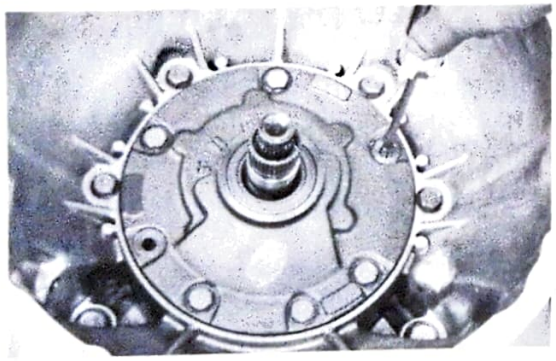
NOTE: In spite of presence of the bell housing, front oil pump can be installed in the common way.

(a) Coat thrust washer with petroleum jelly and install facing lip side toward pump body.



(b) Install oil pump gently through two guide pins being careful the thrust washer does not fall out and that you do not damage the O-ring.

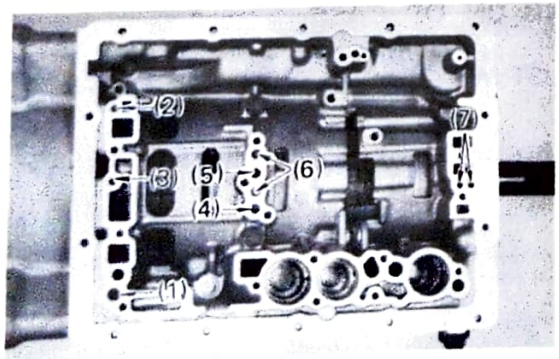
(c) Coat five set bolts with seal packing and finger tighten them.



(d) Using a screwdriver, remove two guide pins. In place of them, install two set bolts coated with seal packing.

(e) Tighten the set bolts gradually and evenly.

Torque: 1.8 – 2.5 kg-m (14 – 18 ft-lb)

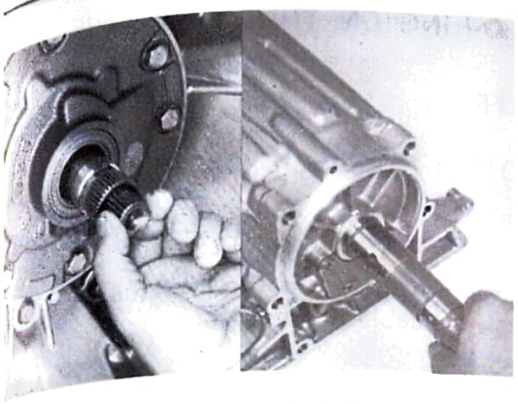


29. CHECK OPERATION OF PISTONS

Blow low-pressure compressed air into passages indicated on the photo and listen for noise from piston movement.

(1) Overdrive clutch
(2) Overdrive brake
(3) Front Clutch
(4) Brake No. 1
(5) Brake No. 2
(6) Rear clutch
(7) Brake No. 3

If pistons do not move, disassemble and inspect.

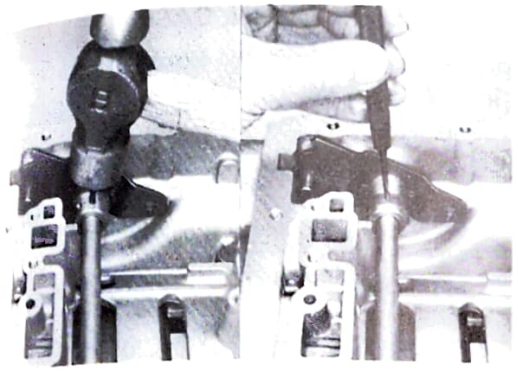


30. CHECK INPUT SHAFT AND OUTPUT SHAFT

(a) Make sure that input shaft has play in axial direction and that it turns lightly.

(b) Make sure that output shaft has thrust play in axial direction.

Thrust play: 0.3 – 0.9 mm (0.012 – 0.035 in.)



31. INSTALL MANUAL VALVE LEVER SHAFT INTO CASE

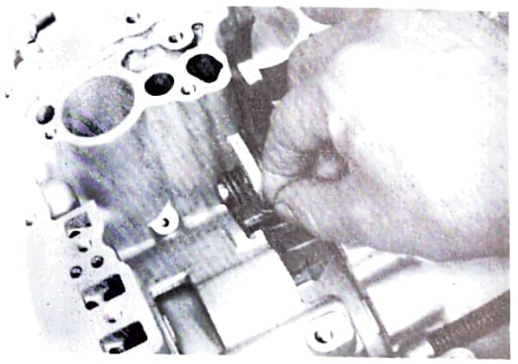
(a) Assemble the new collar to the manual valve lever.

NOTE: Always replace the collar and roll pin with a new one. Never reuse a pin after it has been removed.

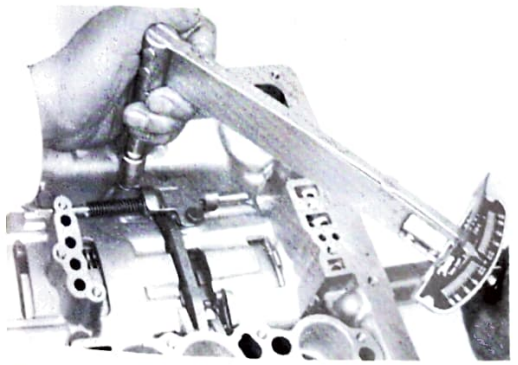
(b) Install the manual valve lever shaft to the transmission case through the manual valve lever.

(c) Drive in a new roll with the slot at a right angle to the shaft.

(d) Match the collar hole to the lever calking hollow and calk the collar to the lever.



32. INSTALL PARK PAWL, PIVOT PIN AND SPRING IN CASE



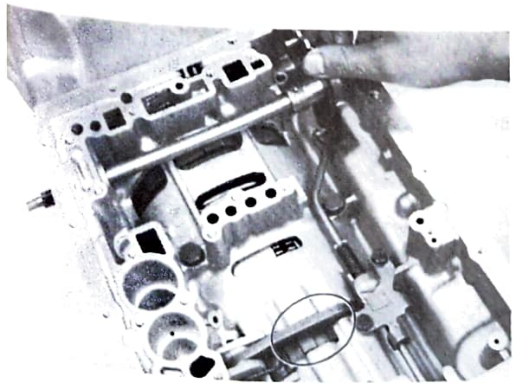
33. INSTALL PARK PAWL BRACKET ON CASE

Make sure that the collar on the control rod is toward the front of the transmission.

Tighten two bolts. Make sure that pawl moves freely.

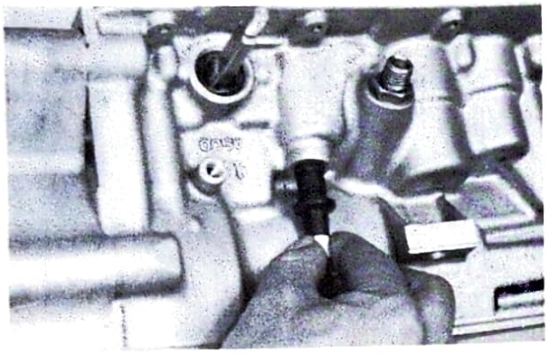
NOTE: It is possible for bracket to be installed too far forward, where it will bind the pawl.

Torque: 0.6 – 0.9 kg-m (53 – 78 in.-lb)



34. CHECK OPERATION OF PARK LOCK PAWL

Make sure that planetary gear output shaft is locked when the manual valve lever is shifted at P position.



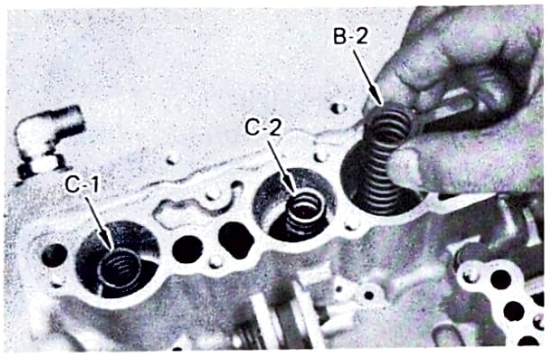
35. INSTALL NEW O-RING ON THROTTLE CABLE FITTING

Lubricate with ATF.

36. INSTALL THROTTLE CABLE IN CASE

Push through the case, being careful not to damage the O-ring. Check for full seating.

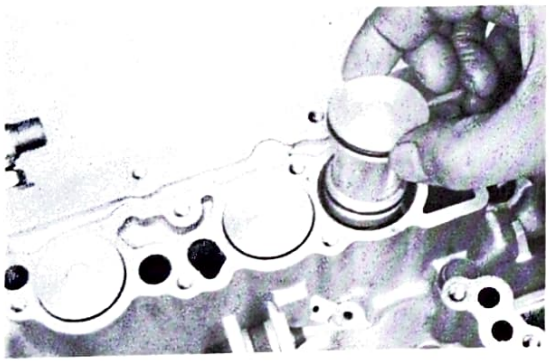
CAUTION: In subsequent work, do not roll case over the cable and break the cable fitting.



37. SET ACCUMULATOR SPRINGS IN CASE

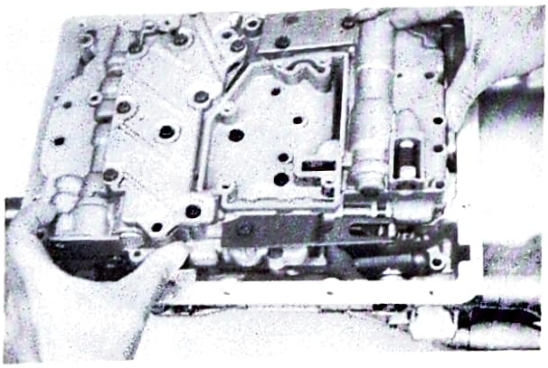
Place longest spring in opening at front of the case, shortest spring in the middle opening and remaining spring in the rear opening.

	Free length mm (in.)	Outer diameter mm (in.)
B-2	66.50 (2.6181)	17.91 (0.7051)
C-2	55.18 (2.1724)	15.87 (0.6248)
C-1	64.80 (2.5512)	17.20 (0.6772)



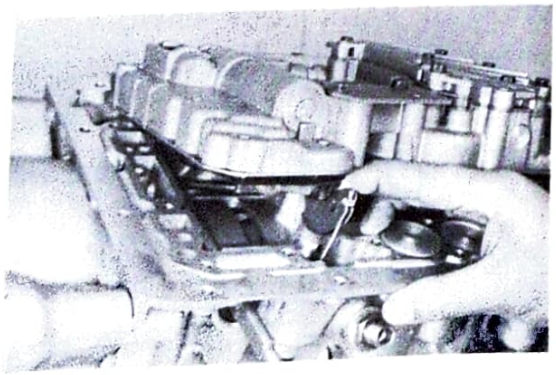
38. INSTALL ACCUMULATOR PISTONS

Place smallest piston in the middle. Place longest piston in the rear, and remaining piston in the front.



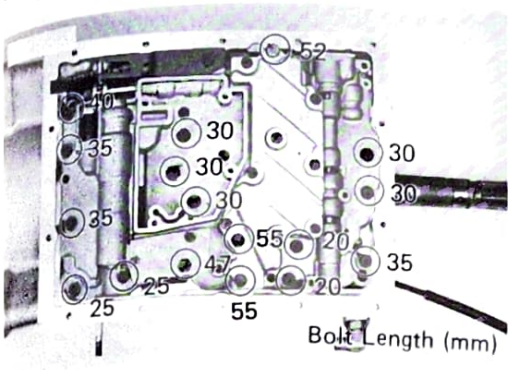
39. PLACE VALVE BODY ON TRANSMISSION

Make sure accumulator pistons are pressed fully into the bore. Align manual valve with pin on the manual shift lever, and lower valve body into place.



40. LIFT SIDE OF VALVE BODY AND ATTACH THROTTLE CABLE

While holding cam down with fingers, slip the cable end into the slot.

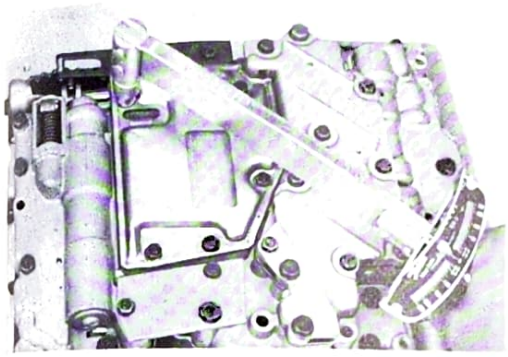


41. INSTALL SEVENTEEN BOLTS IN VALVE BODY

Install bolts as shown.

Tighten seventeen bolts.

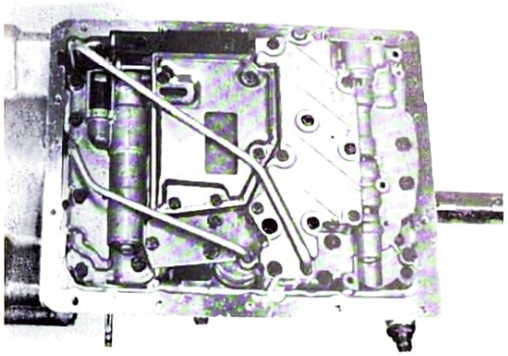
Torque: 0.8 – 1.2 kg-m (70 – 104 in.-lb)



42. INSTALL OIL SCREEN AND BOLTS

Install five bolts and tighten them.

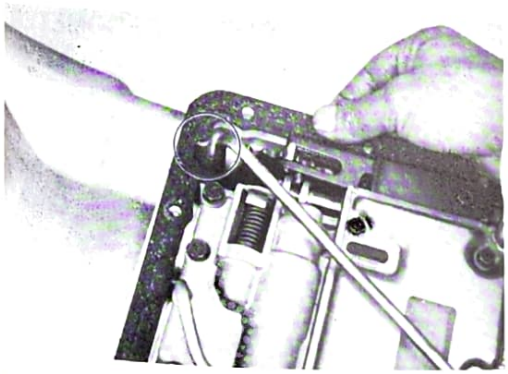
Torque: 0.5 – 0.6 kg-m (44 – 52 in.-lb)



43. INSTALL TWO OIL TUBES

Press the tubes into the positions indicated in the figure by hand.

CAUTION: **Be careful not to bend or damage the tubes.**



44. INSTALL MAGNET IN PAN AND INSTALL OIL PAN WITH NEW GASKET

Align the cut part of gasket and case.

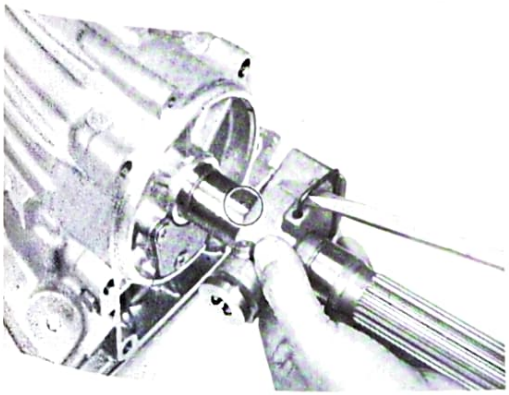
Tighten fourteen bolts.

Torque: 0.4 – 0.5 kg-m (35 – 43 in.-lb)

45. INSTALL DRAIN PLUG WITH NEW GASKET

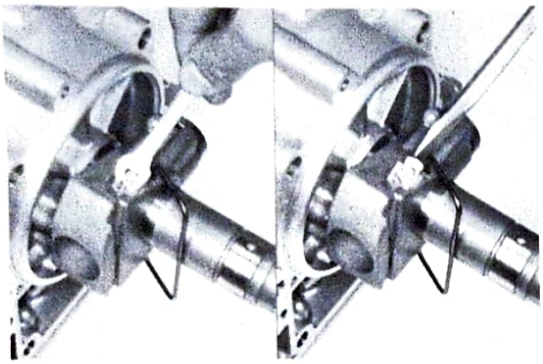
Tighten drain plug.

Torque: 1.8 – 2.3 kg-m (13 – 16 ft-lb)



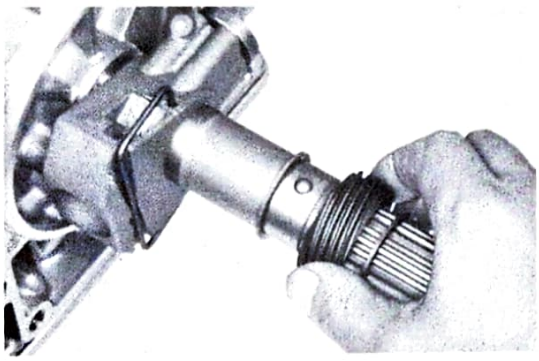
46. INSTALL GOVERNOR BODY ON OUTPUT SHAFT

(a) While lifting the retaining clip with a large screwdriver, slide the governor body and insert retaining clip end into the hole on output shaft.



(b) Install the lock screw and then stake the lock plate.

Torque: 0.3 – 0.5 kg-cm (27 – 43 in.-lb)

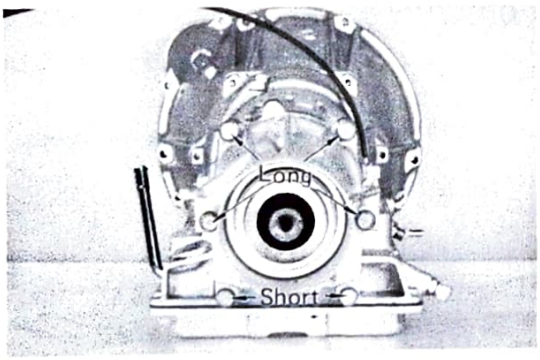


47. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the snap ring and lock ball.

(b) Slide the speedometer gear on the shaft.

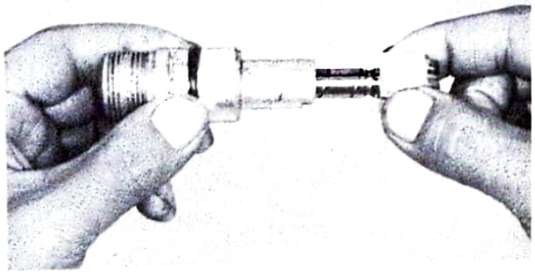
(c) Using snap ring pliers, install the outer snap ring.



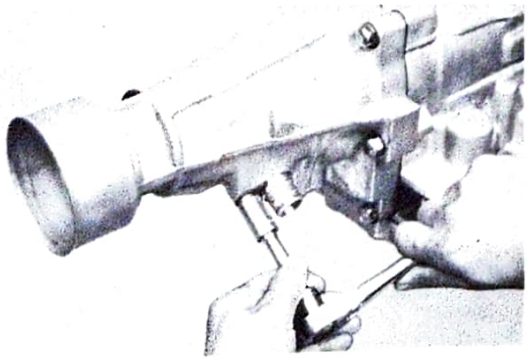
48. INSTALL REAR EXTENSION HOUSING WITH NEW GASKET

Do not use gasket sealer. Install housing with four long bolts and two short bolts. Tighten bolts.

Torque: 2.7 – 4.2 kg-m (20 – 30 ft-lb)

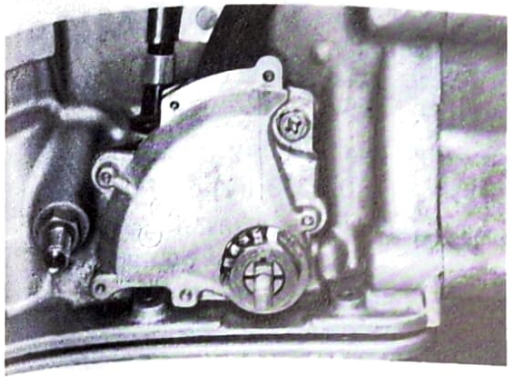


49. INSTALL O-RINGS, BUSHING AND SPEEDOMETER DRIVEN GEAR TO SHAFT SLEEVE



50. INSTALL SPEEDOMETER DRIVEN GEAR ASSEMBLY IN EXTENSION HOUSING

Insert the shaft sleeve assembly into housing. Install the lock plate with bolt and lock washer.

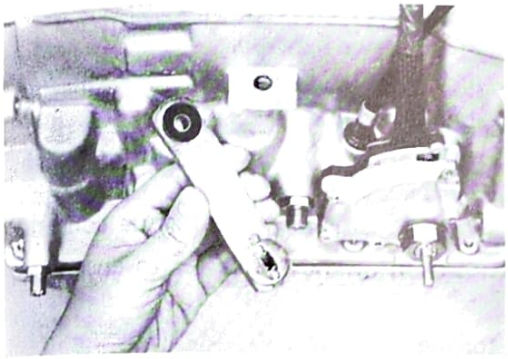


51. INSTALL NEUTRAL SWITCH

(a) Slide the neutral switch onto the control shaft.

(b) Install the grommet facing the groove toward switch body and then install washer and nut.

(c) Move the switch so that the slit in switch and neutral base line match up. Tighten the bolt and nut.

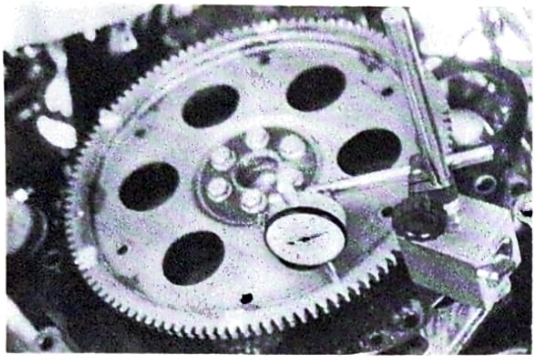


52. INSTALL SHIFT HANDLE

53. INSTALL SOLENOID

Install the solenoid with two O-rings on the body being careful they do not fall out.

INSTALLATION OF TRANSMISSION

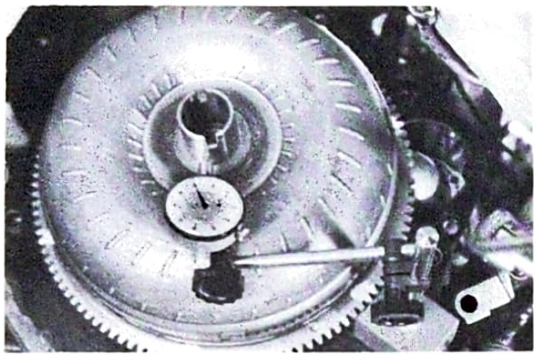


1. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure drive plate runout.

If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace drive plate. If installing new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 6.0 – 7.0 kg-m (43 – 50 ft-lb)



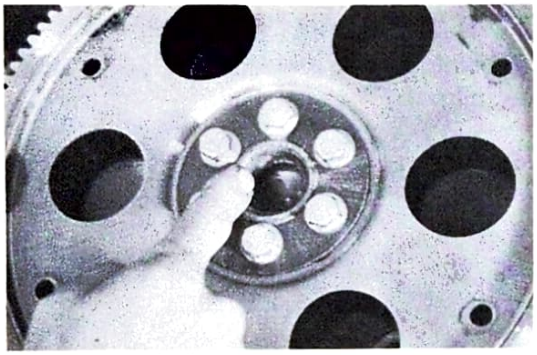
2. MEASURE TORQUE CONVERTER SLEEVE RUNOUT

(a) Temporarily mount the torque converter to the drive plate. Set up a dial indicator.

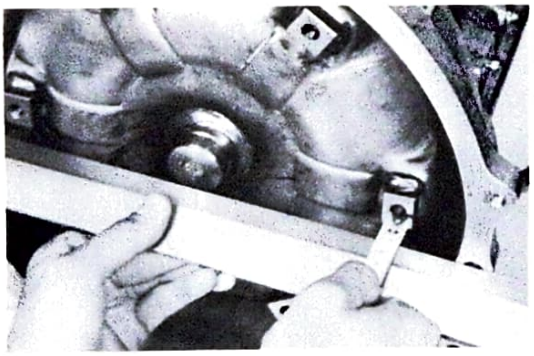
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter.

NOTE: Mark the position of the converter to ensure correct installation.

(b) Remove the torque converter.



3. APPLY GREASE TO CENTER HUB OF TORQUE CONVERTER AND PILOT HOLE IN DRIVE PLATE



4. INSTALL TORQUE CONVERTER IN TRANSMISSION

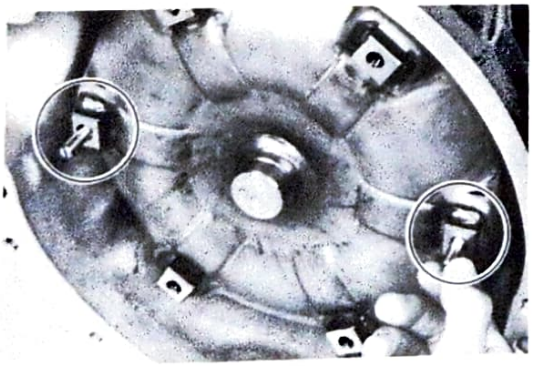
If the torque converter has been drained and washed, refill with fresh ATF.

ATF capacity: 2.5 liters (2.6 US qts, 2.2 Imp.qts)

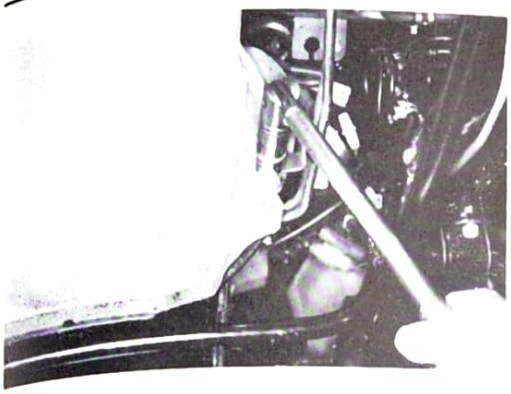
5. CHECK TORQUE CONVERTER INSTALLATION

Using calipers and a straight edge, measure from the center hub to the front surface of the transmission housing.

Correct distance: 20 mm (0.79 in.)



6. INSTALL GUIDE PIN IN TORQUE CONVERTER



7. INSTALL TRANSMISSION ASSEMBLY

CAUTION: **Be careful not to let the Torque Converter Slide out.**

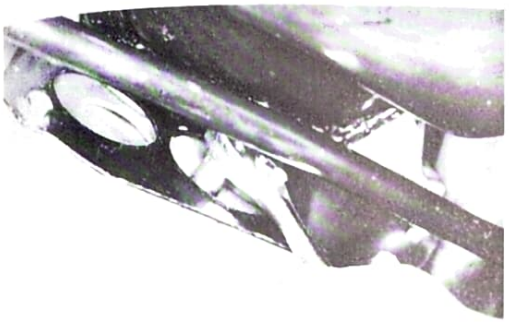
(a) Align the guide pin with one of the drive plate holes.

(b) Align the upper starter stud with the hole in the engine plate.

(c) Align two sleeves on the block with the converter housing.

(d) Tighten the transmission housing mounting bolts.

Torque: 5.0 – 8.0 kg-m (37 – 57 ft-lb)



8. INSTALL SIX TORQUE CONVERTER BOLTS

(a) Remove guide pin.

(b) Install six bolts finger tight. Turn the crankshaft to gain access.

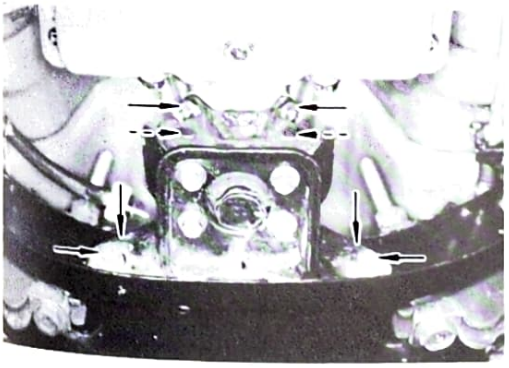
(c) Tighten the bolts evenly.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

9. INSTALL TWO RUBBER PLUGS IN SERVICE HOLES AT REAR OF ENGINE

10. INSTALL ENGINE UNDERCOVER

11. JACK UP TRANSMISSION SLIGHTLY AND REMOVE WOODEN PIECE BETWEEN ENGINE OIL PAN AND MEMBER



12. INSTALL ENGINE REAR MOUNTING WITH BRACKET

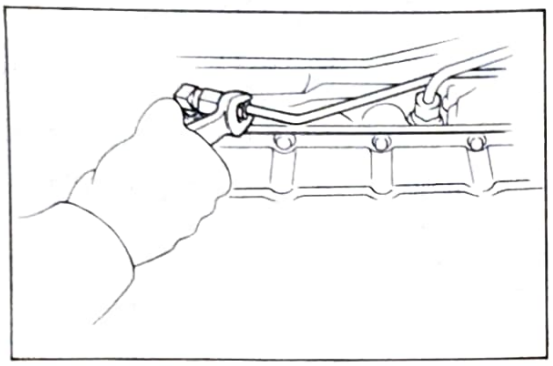
(a) Install the engine rear mounting with bracket to the member.

Torque: 3.5 – 5.0 kg-m (26 – 36 ft-lb)

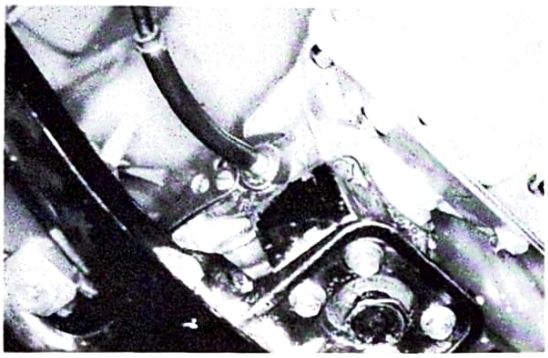
(b) Lower the transmission and connect the mounting to the extension housing.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)

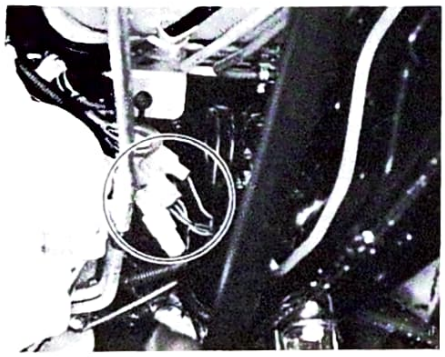
13. INSTALL OIL FILLER TUBE AND CONNECT EXHAUST PIPE CLAMP



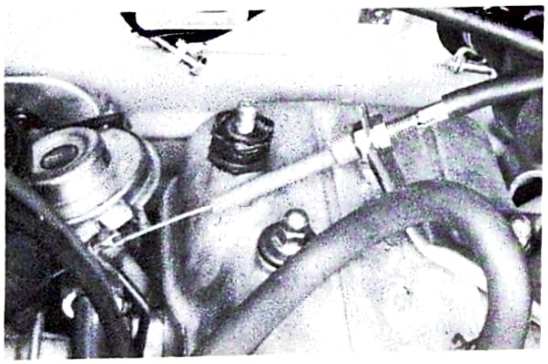
14. CONNECT OIL COOLER LINES
    Torque: 3.0 – 4.0 kg-m (22 – 29 ft-lb)



15. CONNECT MANUAL SHIFT LINKAGE
16. CONNECT SPEEDOMETER CABLE
17. INSTALL PROPELLER SHAFT (See page 12-8)



18. INSTALL STARTER
19. CONNECT WIRING CONNECTORS TO SOLENOID, NEUTRAL START AND BACK-UP LIGHT SWITCHES
    Connect the connectors located near the starter.



20. CONNECT TRANSMISSION THROTTLE CABLE (See page 10-23)
21. ADJUST THROTTLE CABLE (See page 10-6)
22. INSTALL AIR CLEANER ASSEMBLY
23. CONNECT BATTERY CABLE TO NEGATIVE ⊖ TERMINAL

24. FILL TRANSMISSION WITH ATF
    (a) Add about 4.0 liters (4.2 USqts, 3.5 Imp.qts) of ATF.
    (b) Start the engine, shift into each gear and put into PARK.
    (c) Check the fluid level and add ATF to the upper mark.
    Total Capacity:
    A43D 6.5 liters (6.9 US qts, 5.7 Imp.qts)
25. PERFORM ROAD TEST (See page 10-10)

TRANSFER

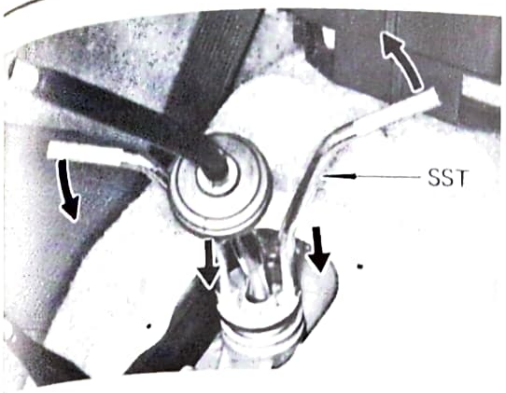
	Page
TROUBLESHOOTING	11-2
SPECIAL TOOLS AND TEST EQUIPMENT	11-2
TRANSFER	11-3

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Tires improperly inflated Front and rear tire size different Transfer faulty	Inflate tires to proper pressure Correct tire size Disassemble and inspect transfer	13-28 13-28 11-3
Transfer jumps out of gear	Transfer faulty	Disassemble and inspect transfer	11-3
Oil leak at companion flange	Oil seal worn or damaged Wrong oil seal	Replace oil seal Correct oil seal	11-17, 18 11-17, 18

SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Transmission shift lever remover	09305-20012	To remove transmission shift lever
Companion flange holder	09330-00020 or Commercial	To remove and install companion flange
Companion flange remover	09557-22022	To remove companion flange
Snap ring pliers	09905-00012 or Commercial	To remove snap ring
Universal pullers	09950-20014 or Commercial	To remove input gear bearing and counter gear bearing
Bearing replacer	09316-60010 or Commercial	To install input gear bearing, output shaft bearing, counter gear bearing, idler gear bearing and front drive gear bearing
Oil seal puller	09308-00010 or Commercial	To remove extension housing oil seal and oil pump screw oil seal
Bearing replacer	09310-35010 or Commercial	To remove and install front case roller bearing To install rear case roller bearing and oil pump screw oil seal
Bearing puller	09612-30012 or Commercial	To remove front case roller bearing and rear case roller bearing
Transmission oil plug	09325-20010 or Commercial	To install extension housing oil seal To remove and install front drive gear bearing retainer oil seal



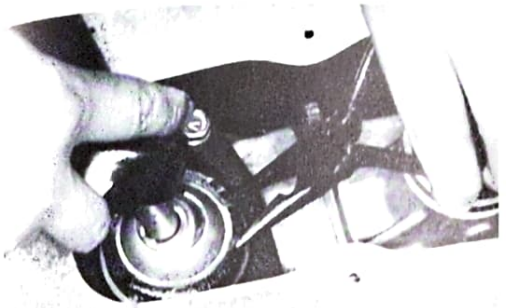
TRANSFER

REMOVAL OF TRANSFER

1. REMOVE TRANSMISSION SHIFT LEVER FROM INSIDE OF VEHICLE

Using SST*, remove the transmission shift lever from the transmission.

*SST 09305-20012

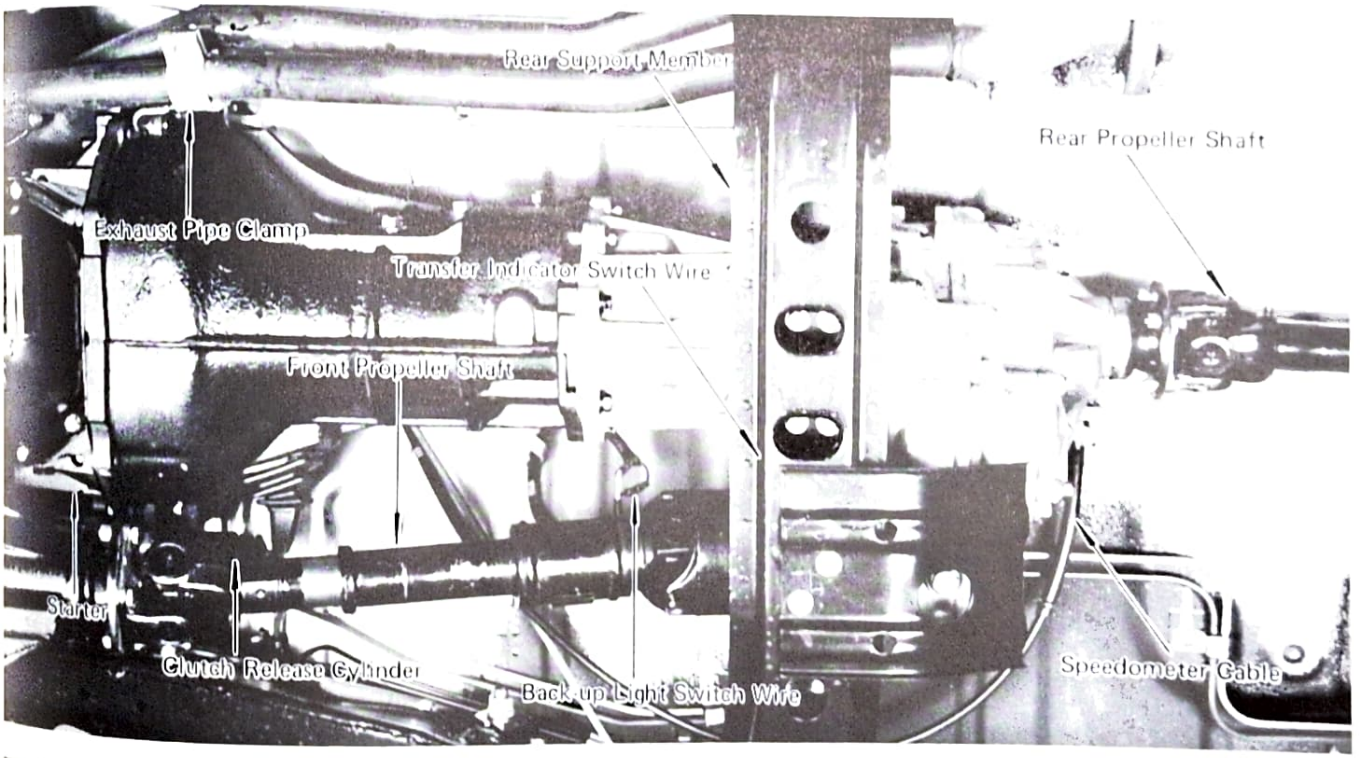


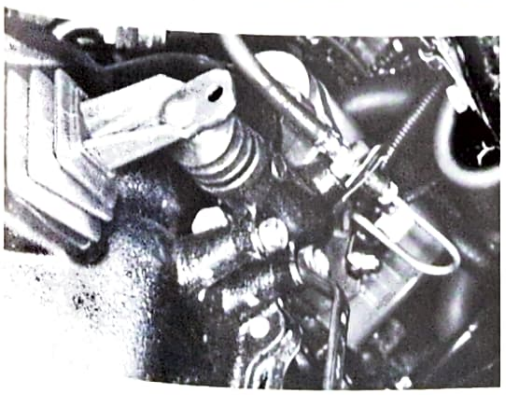
2. REMOVE TRANSFER SHIFT LEVER FROM INSIDE OF VEHICLE

Using pliers remove the transfer shift lever from the transfer.

3. RAISE VEHICLE AND DRAIN TRANSMISSION AND TRANSFER

CAUTION: Be sure the vehicle is securely supported.



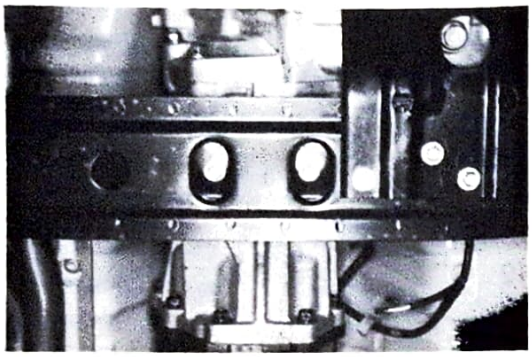


4. REMOVE PROPELLER SHAFT (See page 12-3)

5. REMOVE CLUTCH RELEASE CYLINDER AND STARTER

(a) Remove the release cylinder mounting bolts and the starter mounting bolt and nut.

(b) Lay the release cylinder and starter alongside the engine.

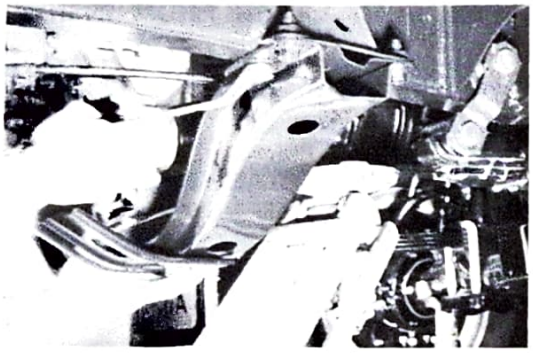


6. DISCONNECT SPEEDOMETER CABLE

7. DISCONNECT BACK-UP LIGHT SWITCH WIRE AND TRANSFER INDICATOR SWITCH WIRE

8. DISCONNECT EXHAUST PIPE CLAMP FROM TRANSMISSION HOUSING

9. REMOVE FOUR ENGINE REAR MOUNTING BOLTS FROM SUPPORT MEMBER

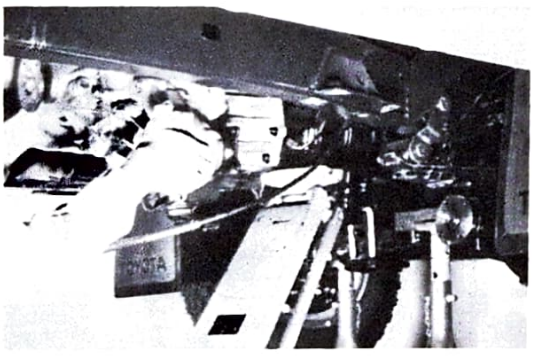


10. JACK UP TRANSMISSION SLIGHTLY

Raise the transmission enough to remove the weight from the rear support.

11. REMOVE REAR SUPPORT MEMBER

Remove eight bolts, and remove the support member.

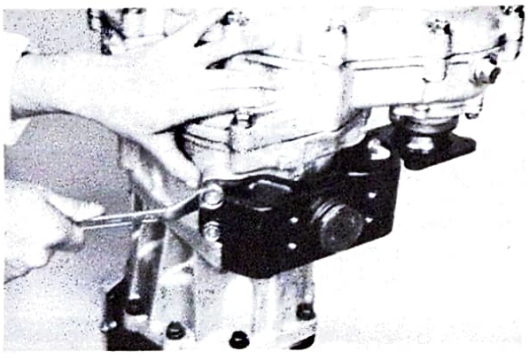


12. REMOVE REMAINING TRANSMISSION HOUSING BOLTS

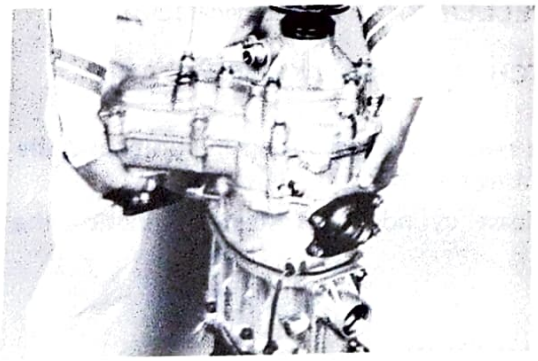
13. REMOVE TRANSMISSION AND TRANSFER ASSEMBLY

(a) Place a safety support with a wooden block under the engine and lower the jack until the engine is resting on the support.

(b) Draw out the transmission and transfer assembly down and toward the rear.



14. REMOVE ENGINE REAR MOUNTING



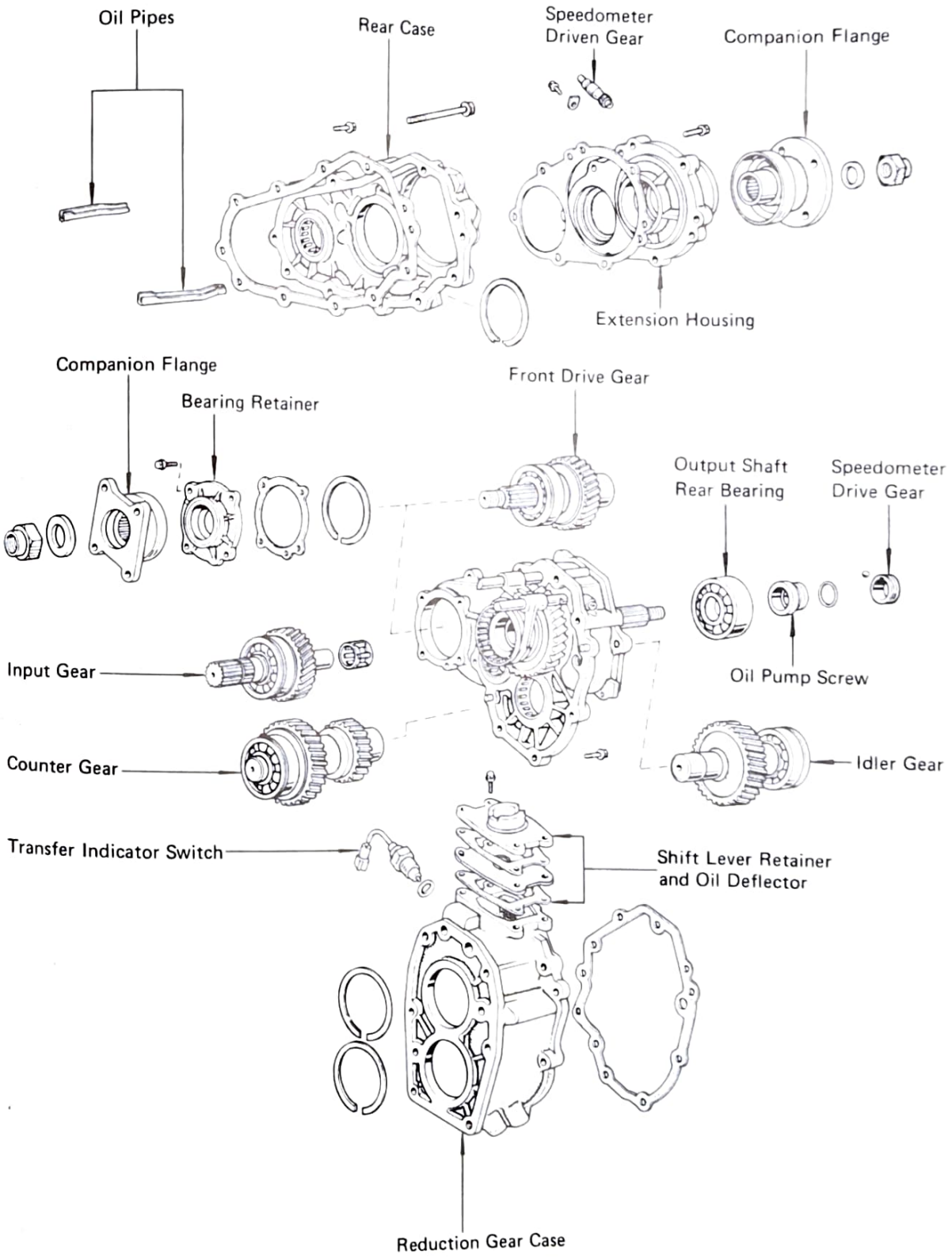
15. REMOVE TRANSFER FROM TRANSMISSION

(a) Remove the transfer adapter rear mounting bolts.

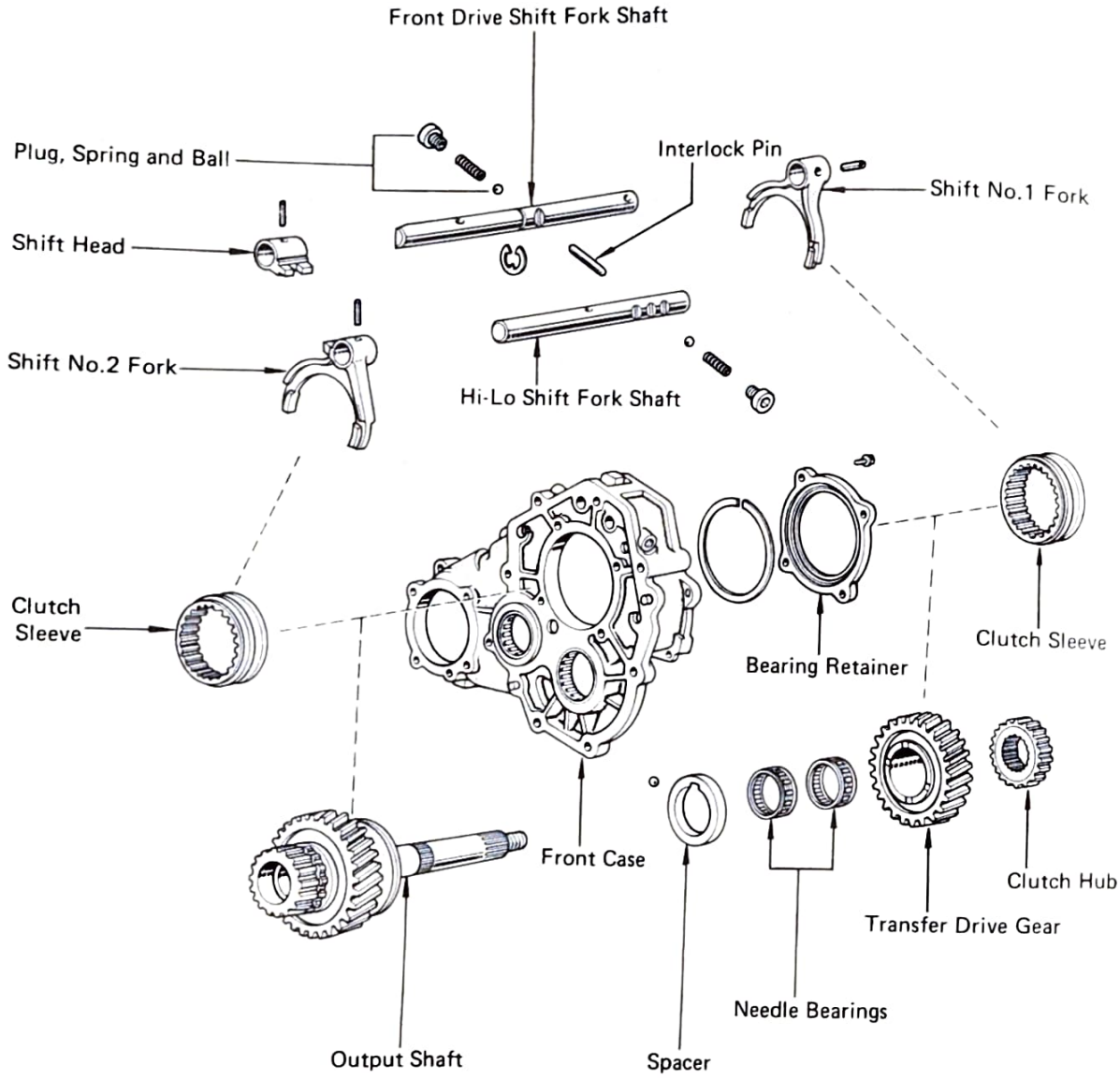
(b) Pull the transfer straight up and remove it from the transmission.

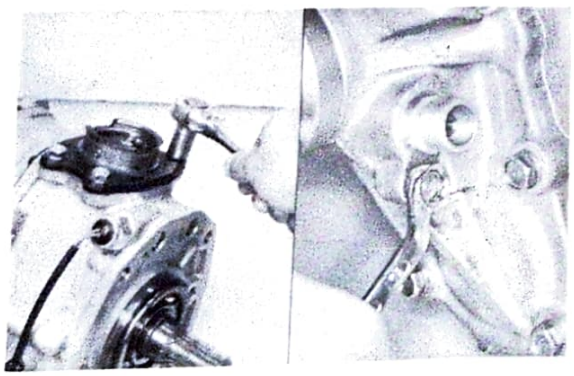
CAUTION: Take care not to damage the adapter rear oil seal by the transfer input gear spline.

TRANSFER DISASSEMBLY VIEW



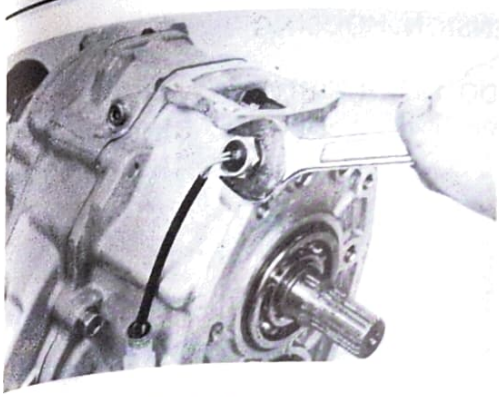
TRANSFER DISASSEMBLY VIEW (CONT'D)



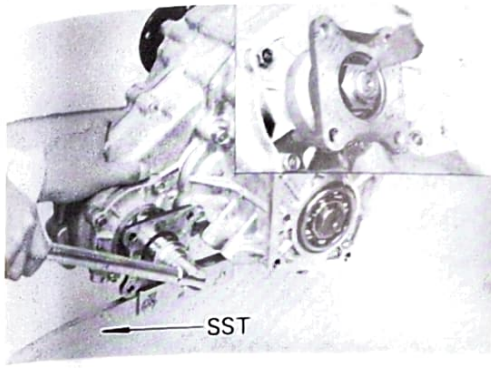


DISASSEMBLY OF TRANSFER

1. REMOVE TRANSFER SHIFT LEVER RETAINER AND OIL DEFLECTOR
2. REMOVE SPEEDOMETER DRIVEN GEAR



3. REMOVE TRANSFER INDICATOR SWITCH



4. REMOVE FRONT COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

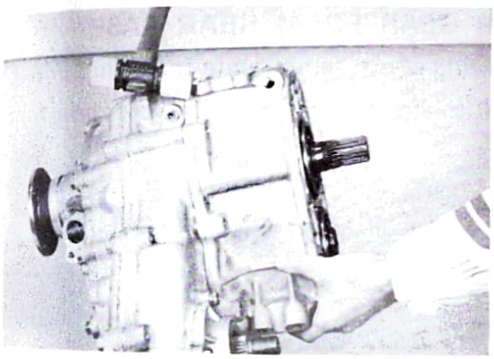
(b) Using a holder* to hold the flange, remove the nut.

*SST 09330-00020 or Commercial holder

(c) Using a hammer, tap the companion flange off the shaft.

NOTE: If a flange remover* is available, remove the companion flange with it.

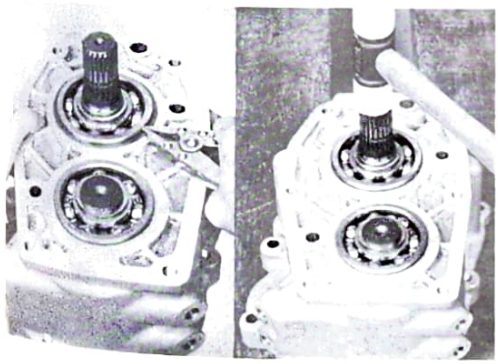
*SST 09557-22022



5. REMOVE REDUCTION GEAR CASE

(a) Remove the four long mounting bolts and four short ones.

(b) Using a plastic hammer, remove the reduction gear case with the input gear and counter gear.

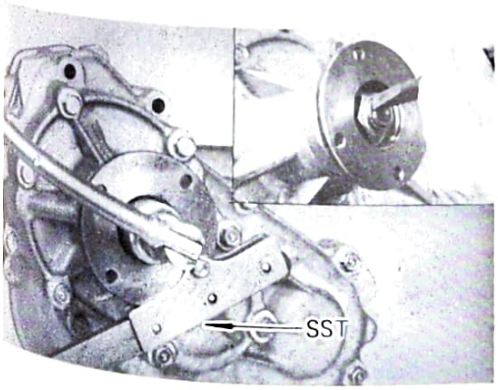


6. REMOVE INPUT GEAR AND COUNTER GEAR FROM REDUCTION GEAR CASE

(a) Using a snap ring pliers, remove the two snap rings.

(b) Using a plastic hammer, tap out the input gear and counter gear from the reduction gear case.

NOTE: Place the reduction gear case on something soft such as wooden blocks.



7. REMOVE REAR COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

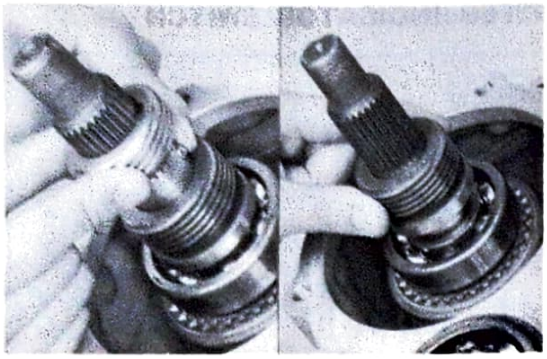
(b) Using a holder* to hold the flange, remove the nut.

*SST 09330-00020 or Commercial holder

(c) Using a hammer, tap the companion flange off the shaft.

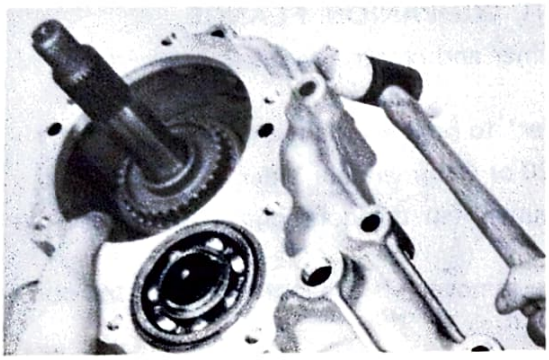
NOTE: If a flange remover* is available, remove the companion flange with it.

*SST 09557-22022



8. REMOVE EXTENSION HOUSING

9. REMOVE SPEEDOMETER DRIVE GEAR, STEEL BALL, OIL PUMP SCREW AND BEARING

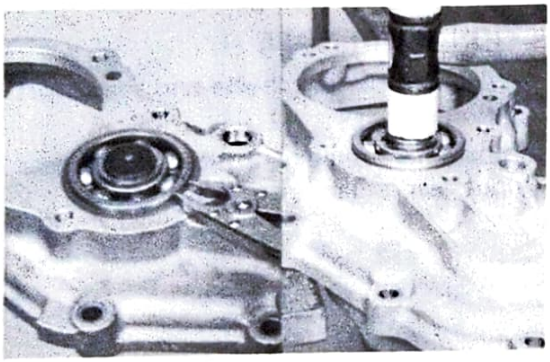


10. REMOVE REAR CASE

(a) Remove the six mounting bolts.

(b) Using a plastic hammer, remove the rear case with the idler gear.

NOTE: Hold the front case so the rear is not lowered. If it is lowered, the clutch hub and steel ball may fall out.

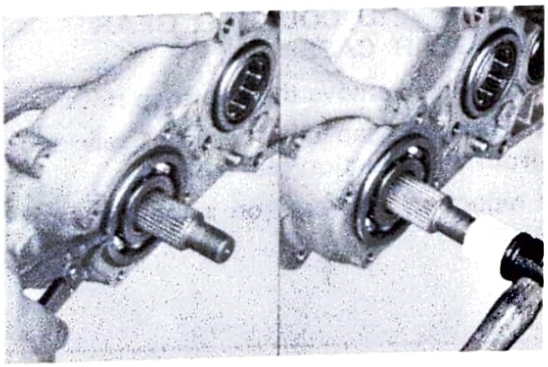


11. REMOVE IDLER GEAR FROM REAR CASE

(a) Using a snap ring pliers, remove the snap ring.

(b) Using a plastic hammer, tap out the idler gear from the rear case.

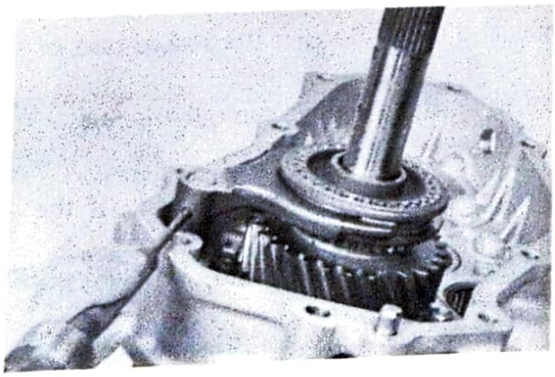
NOTE: Place the rear case on something soft such as wooden blocks.



12. REMOVE FRONT DRIVE GEAR

(a) Using a snap ring pliers, remove the snap ring.

(b) Using a plastic hammer, tap out the front drive gear from the front case.

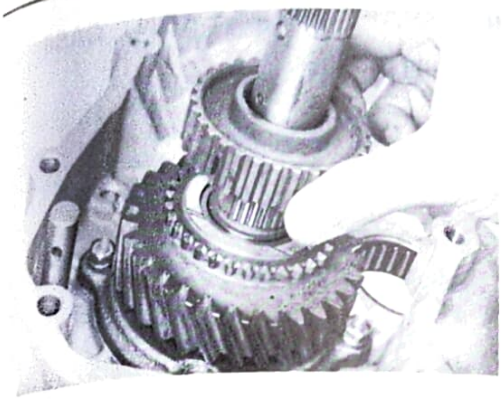


13. REMOVE SHIFT NO.1 FORK AND CLUTCH SLEEVE

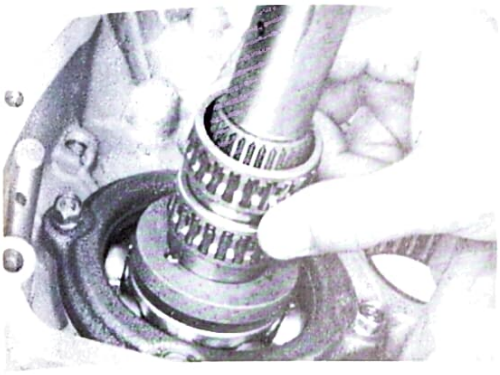
(a) Shift the shift fork shafts to the high-two position.

(b) Using a pin punch, drive out the slotted spring pin.

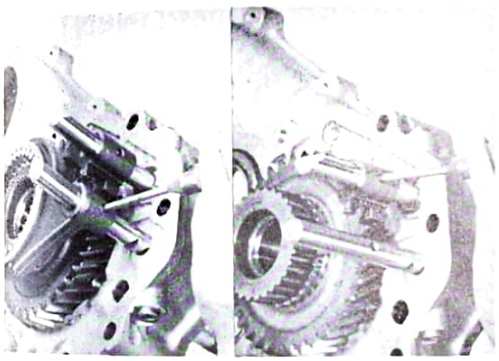
(c) Remove the shift No. 1 fork together with the clutch sleeve.



14. REMOVE CLUTCH HUB AND TRANSFER DRIVE GEAR



15. REMOVE NEEDLE ROLLER BEARINGS, NO. 2 SPACER AND STEEL BALL

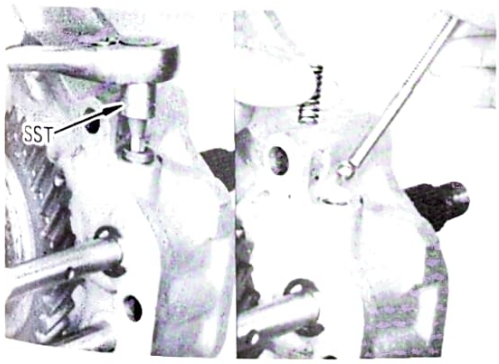


16. REMOVE SHIFT NO. 2 FORK AND CLUTCH SLEEVE

Using a pin punch, drive out the slotted spring pin and remove the shift No.2 fork together with the clutch sleeve.

17. REMOVE SHIFT HEAD

Using a pin punch, drive out the slotted spring pin, and remove the shift head.



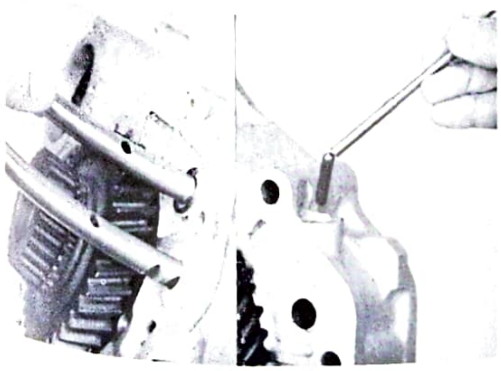
18. REMOVE STRAIGHT SCREW PLUGS SPRINGS AND BALLS

(a) Using an Allen wrench*, remove the plug on the right side.

*SST 09313-30020 or Commercial wrench

(b) Using a magnet, remove the spring and ball.

(c) Remove the plug, spring and ball on the left side by the same procedure.

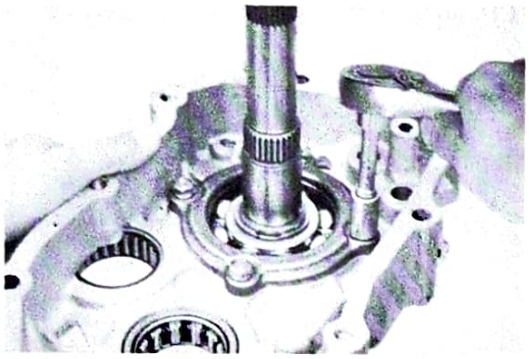


19. REMOVE TWO SHIFT FORK SHAFTS AND INTERLOCK PIN

(a) Remove the front drive shift fork shaft.

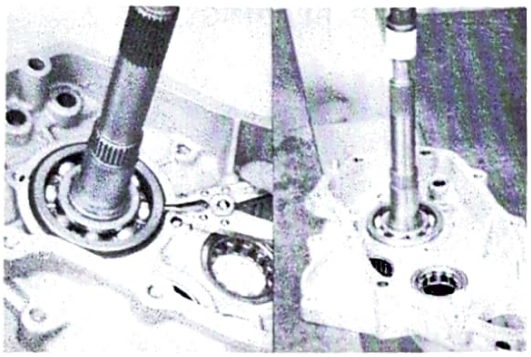
(b) Using a magnet, remove the interlock pin.

(c) Remove the high–low shift fork shaft.



20. REMOVE OUTPUT SHAFT FROM FRONT CASE

(a) Remove the bearing retainer.

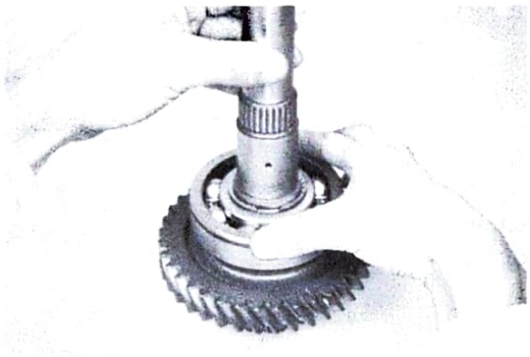


(b) Using a snap ring pliers, remove the snap ring.

(c) Using a plastic hammer, tap out the output shaft from the front case.

NOTE: Place the front case on something soft such as wooden blocks.

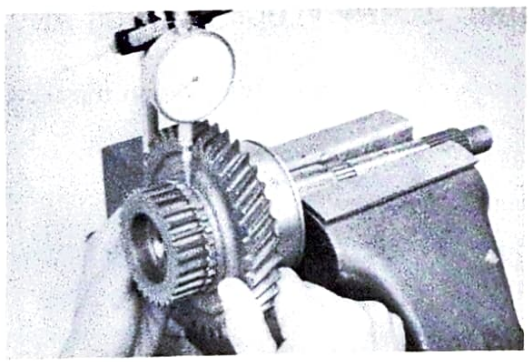
INSPECTION OF TRANSFER COMPONENTS



1. INSPECT OUTPUT SHAFT AND BEARING

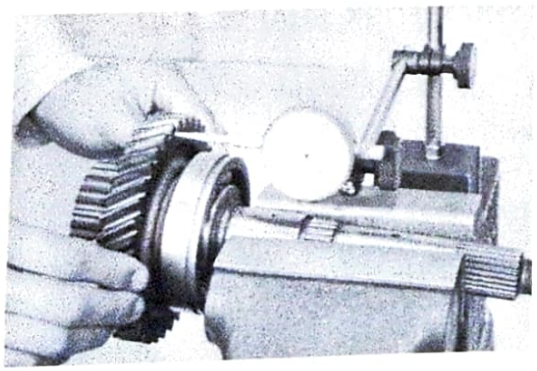
(a) Check for wear or damage.

If bearing is worn or damaged, replace it.



(b) Using a dial indicator, check the low gear oil clearance.

Standard clearance: 0.010 – 0.055 mm (0.0004 – 0.0022 in.)
Maximum clearance: 0.075 mm (0.0030 in.)



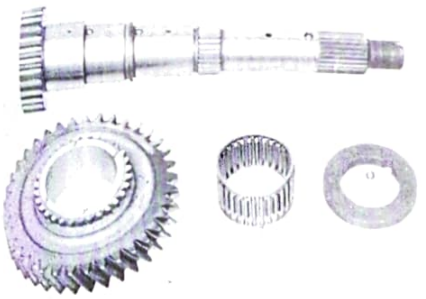
(c) Using a dial indicator, check the low gear thrust clearance.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)

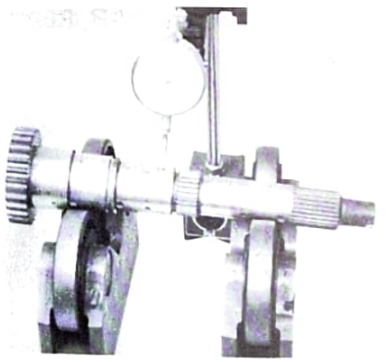
2. IF NECESSARY, REPLACE OUTPUT SHAFT BEARING

(a) Using snap ring pliers, remove the snap ring.

(b) Using a press, remove the bearing.

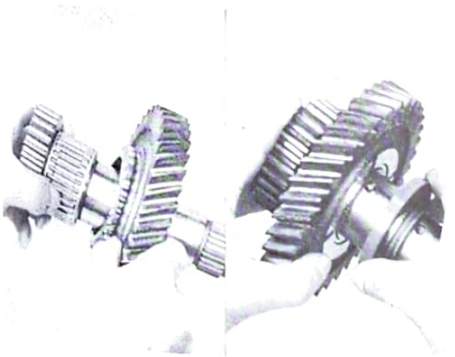


(c) Check the parts for wear or damage.



(d) Using a dial indicator, check the shaft runout.

Maximum runout: 0.03 mm (0.0012 in.)

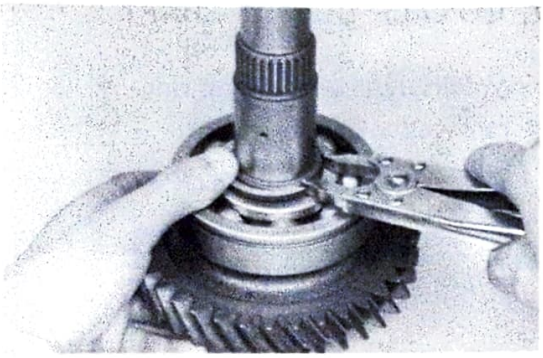


(e) Apply gear oil on the needle roller bearing and spacer.

(f) Install the needle roller bearing and low gear, steel ball and spacer.

(g) Using a press and collar*, install a new bearing.

*SST 09316-60010 or Commercial collar

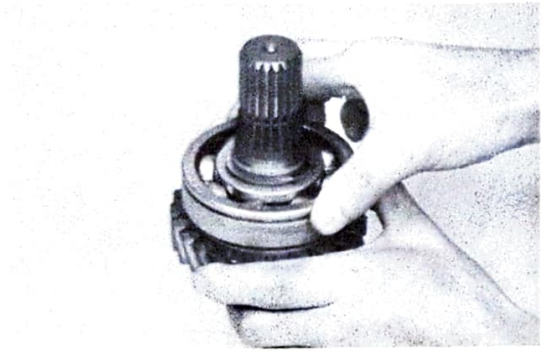


(h) Select a snap ring that will allow minimum axial play and install it on the shaft.

Maximum play: 0.10 mm (0.0039 in.)

Snap ring thickness

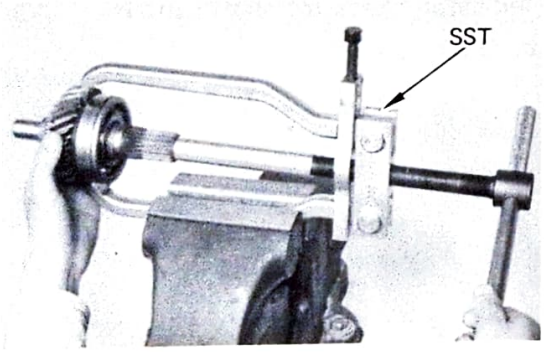
Mark	Part No.	Thickness mm (in.)
0	90520-36250	2.40 – 2.45 (0.0945 – 0.0965)
1	90520-36251	2.45 – 2.50 (0.0965 – 0.0984)
2	90520-36252	2.50 – 2.55 (0.0984 – 0.1004)
3	90520-36253	2.55 – 2.60 (0.1004 – 0.1024)
4	90520-36254	2.60 – 2.65 (0.1024 – 0.1043)
5	90520-36255	2.65 – 2.70 (0.1043 – 0.1063)



3. INSPECT INPUT GEAR AND BEARING

Check for wear or damage.

If bearing is worn or damaged, replace it.

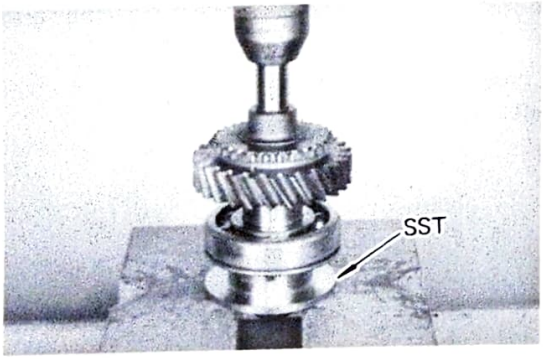


4. IF NECESSARY, REPLACE INPUT GEAR BEARING

(a) Using snap ring pliers, remove the snap ring.

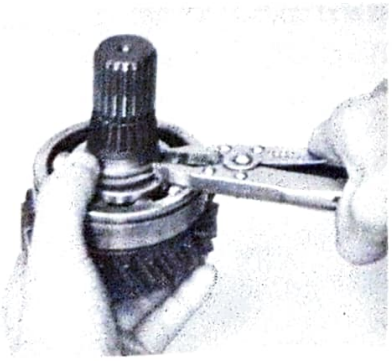
(b) Using a puller*, remove the bearing.

*SST 09950-20014 or Commercial puller



(c) Using a press and collar*, install a new bearing.

*SST 09316-60010 or Commercial collar

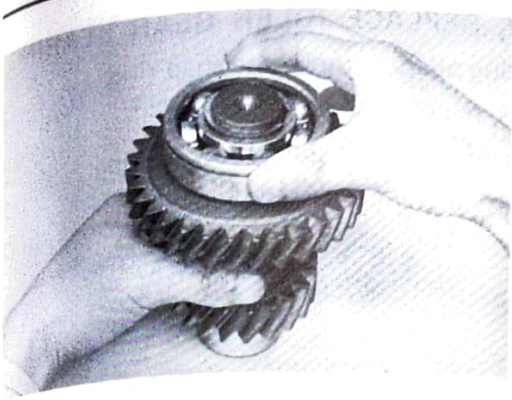


(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

Maximum play: 0.15 mm (0.0059 in.)

Snap ring thickness

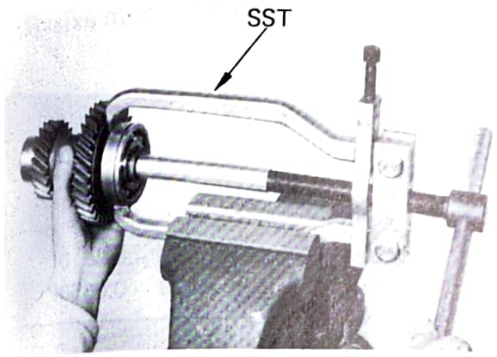
Mark	Part No.	Thickness mm (in.)
1	90520-33168	2.05 – 2.10 (0.0807 – 0.0827)
3	90520-33170	2.15 – 2.20 (0.0846 – 0.0866)
5	90520-33172	2.25 – 2.30 (0.0886 – 0.0906)



5. INSPECT COUNTER GEAR AND BEARING

Check for wear or damage.

If bearing is worn or damaged, replace it.

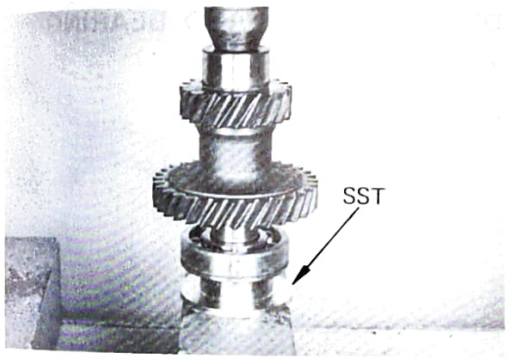


6. IF NECESSARY, REPLACE COUNTER GEAR BEARING

(a) Using snap ring pliers, remove the snap ring.

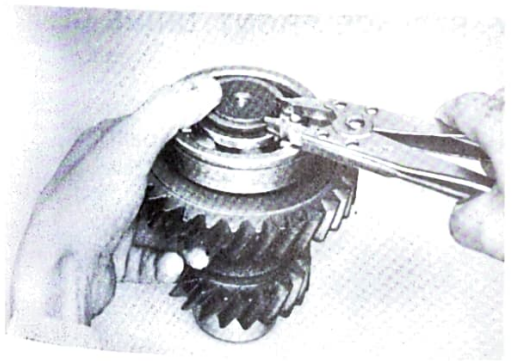
(b) Using a puller*, remove the bearing.

*SST 09950-20014 or Commercial puller



(c) Using a press and collar*, install a new bearing.

*SST 09316-60010 or Commercial collar

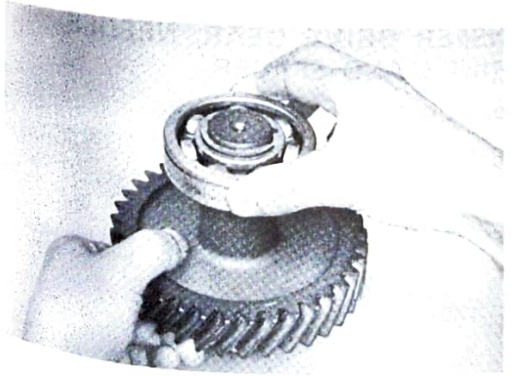


(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

Maximum play: 0.15 mm (0.0059 in.)

Snap ring thickness

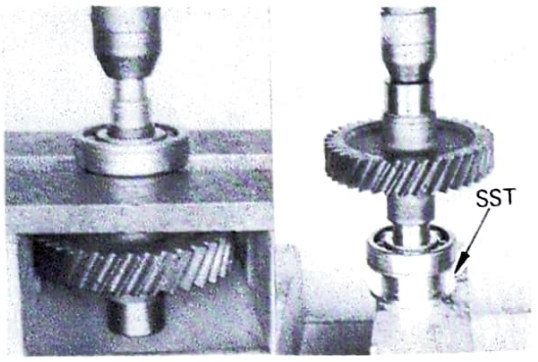
Mark	Part No.	Thickness mm (in.)
1	90520-30215	2.10 – 2.15 (0.0827 – 0.0846)
3	90520-30217	2.20 – 2.25 (0.0866 – 0.0886)



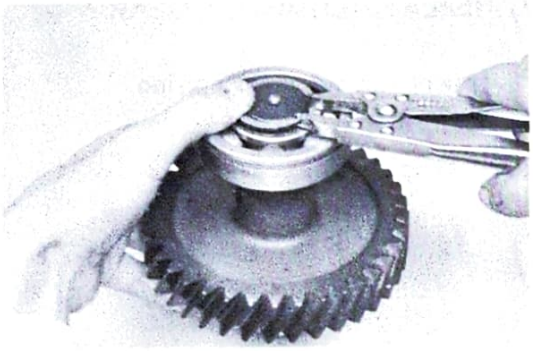
7. INSPECT IDLER GEAR AND BEARING

Check for wear or damage.

If bearing is worn or damaged, replace it.



8. IF NECESSARY, REPLACE IDLER GEAR BEARING
   (a) Using snap ring pliers, remove the snap ring.
   (b) Using a press, remove the bearing.
   (c) Using press and collar*, install a new bearing.
   *SST 09316-60010 or Commercial collar

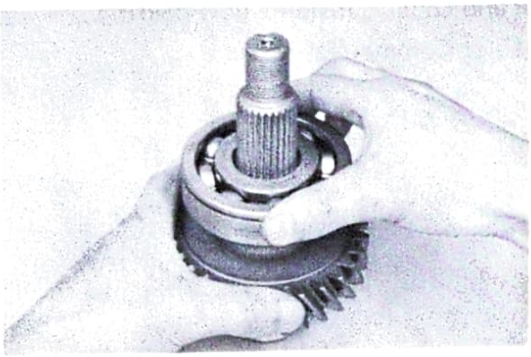


   (d) Select a snap ring that will allow minimum axial play and install it on the shaft.

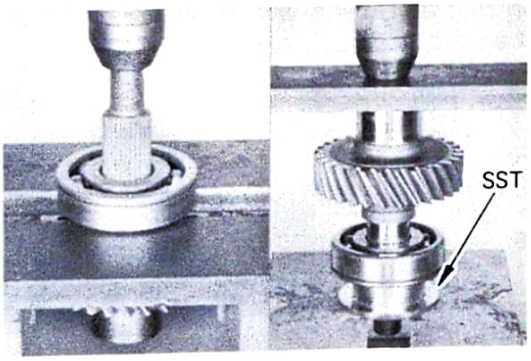
Maximum play: 0.15 mm (0.0059 in.)

Snap ring thickness

Mark	Part No.	Thickness	mm (in.)
A	90520-28242	1.50 – 1.55	(0.0591 – 0.0610)
B	90520-28243	1.60 – 1.65	(0.0630 – 0.0650)

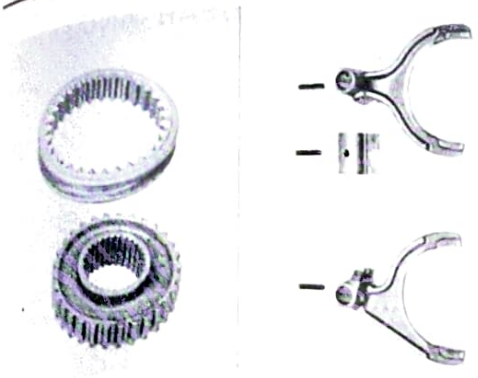


9. INSPECT FRONT DRIVE GEAR AND BEARING
   Check for wear or damage.
   If bearing is worn or damaged, replace it.



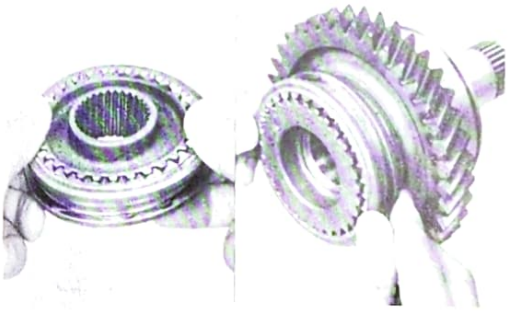
10. IF NECESSARY, REPLACE FRONT DRIVE GEAR BEARING
   (a) Using a press remove the bearing.
   (b) Using a press and collar*, install a new bearing.
   *SST 09316-60010 or Commercial collar

11. INSPECT TRANSFER DRIVE GEAR, NEEDLE ROLLER BEARINGS AND SPACER
   Check for wear or damage.

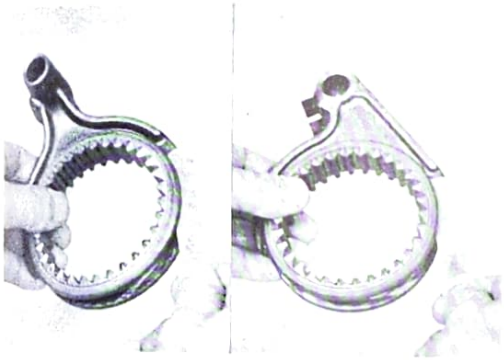


12. INSPECT HUB, HUB SLEEVES AND SHIFT FORKS

(a) Check parts for wear or damage.

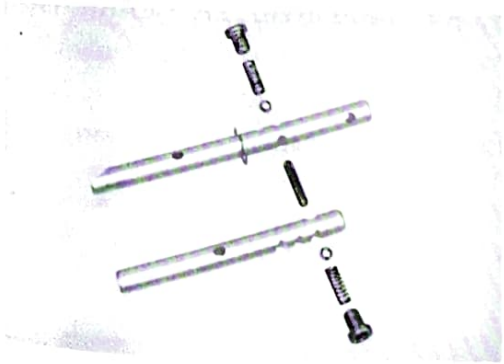


(b) Check that the sleeves slide on the hub or output shaft smoothly.



(c) Check the clearance between the hub sleeve and the shift fork.

Maximum clearance: 1.0 mm (0.039 in.)



13. INSPECT SHIFT FORK SHAFTS

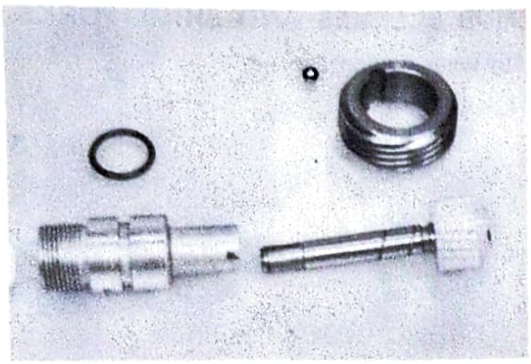
(a) Check sliding surfaces for wear or damage.

(b) Check springs, balls and interlock pin for wear or damage.

14. INSPECT OIL PUMP SCREW AND OIL PIPES

(a) Check the oil pump screw and O-ring for wear or damage.

(b) Check the oil pipes for damage.

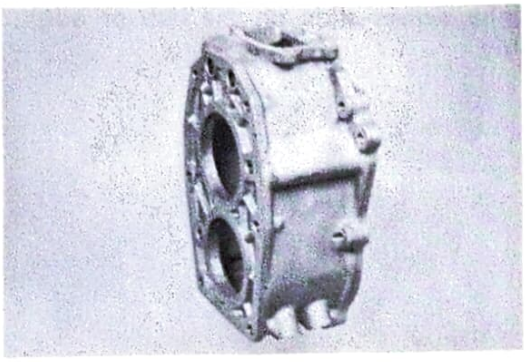


15. INSPECT SPEEDOMETER DRIVE GEAR AND DRIVEN GEAR

(a) Check gear teeth for wear or damage.

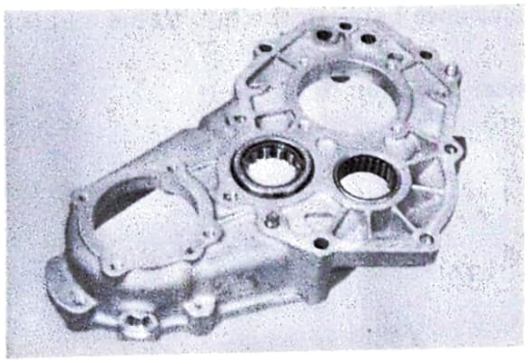
(b) Check gear shaft, oil seal and O-ring for wear or damage.

If the oil seal is worn or damaged, replace it.
(See page 9-34)



16. INSPECT REDUCTION GEAR CASE

Check the reduction gear case for damage or cracks.

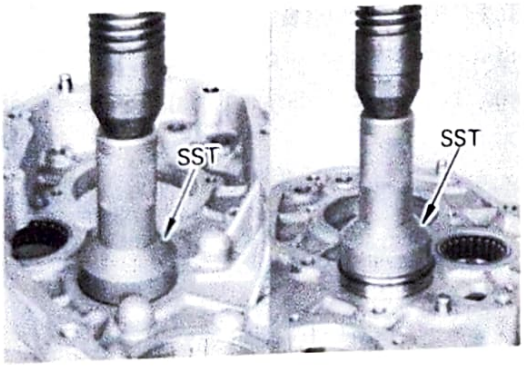


17. INSPECT FRONT CASE

(a) Check the front case for damage or cracks.

(b) Check the roller bearings for wear or damage.

If the roller bearings are worn or damaged, replace them.

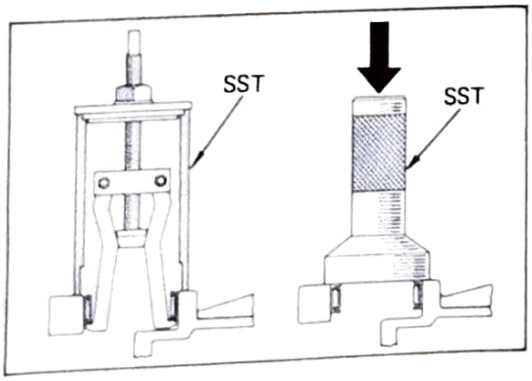


18. IF NECESSARY, REPLACE ROLLER BEARINGS

(a) Using a press and driver*, remove the roller bearing.

*SST 09310-35010 or Commercial driver

(b) Using a press and driver, install the new bearing up to the position of the snap ring.

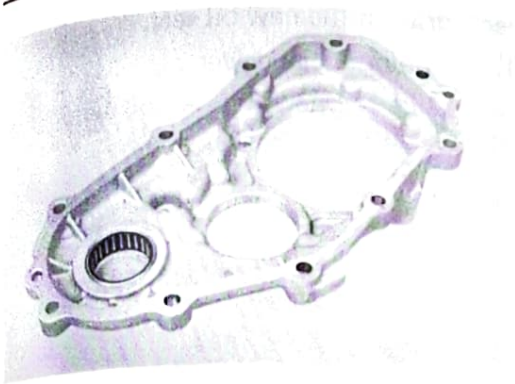


(c) Using SST*, remove the needle roller bearing.

*SST 09612-30012

(d) Using a press and driver*, install the new needle roller bearing.

*SST 09310-35010 or Commercial driver

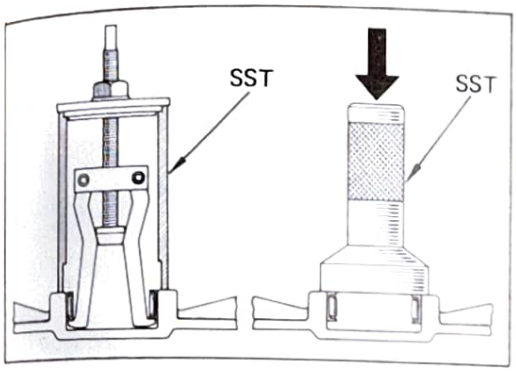


19. INSPECT REAR CASE

(a) Check the rear case for damage or cracks.

(b) Check the needle roller bearing for wear or damage.

If the needle roller bearing is worn or damaged, replace it.



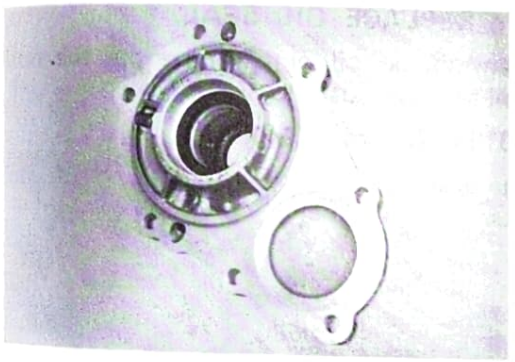
20. IF NECESSARY, REPLACE REAR CASE NEEDLE ROLLER BEARING

(a) Using SST*, remove the needle roller bearing.

*SST 09612-30012

(b) Using a press and driver*, install the new needle roller bearing.

*SST 09310-35010 or Commercial driver

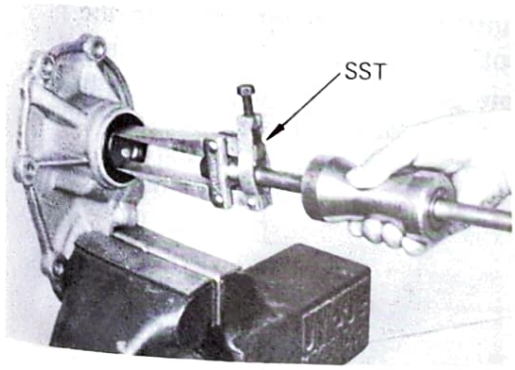


21. INSPECT EXTENSION HOUSING

(a) Check the extension housing for damage or cracks.

(b) Check the oil seals for wear or damage.

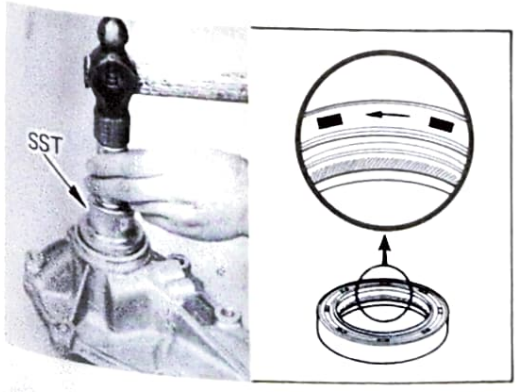
If the oil seals are worn or damaged, replace them.



22. IF NECESSARY, REPLACE OIL SEALS

(a) Using a puller*, remove the two oil seals.

*SST 09308-00010 or Commercial puller

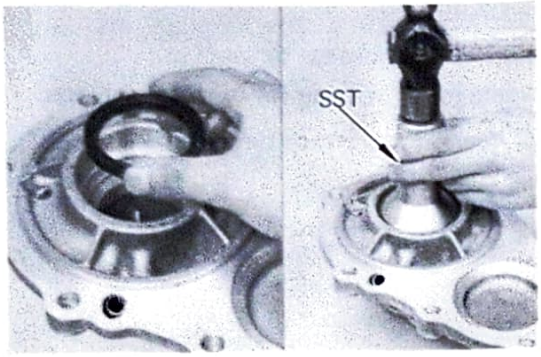


(b) Using a transmission oil plug*, drive in the new oil seal.

*SST 09325-20010 or Commercial driver

NOTE: Take note of the groove direction and be careful not to interchange this seal with the front drive gear oil seal.

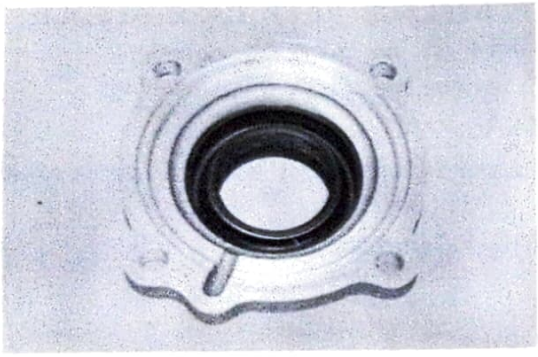
This oil seal has one arrow mark pointing counterclockwise to distinguish it from the front drive gear oil seal.



(c) Using a driver*, drive in the new oil seal.

*SST 09310-35010 or Commercial driver

NOTE: When assembling the new oil seal for the oil pump screw, position the flat surface upward.

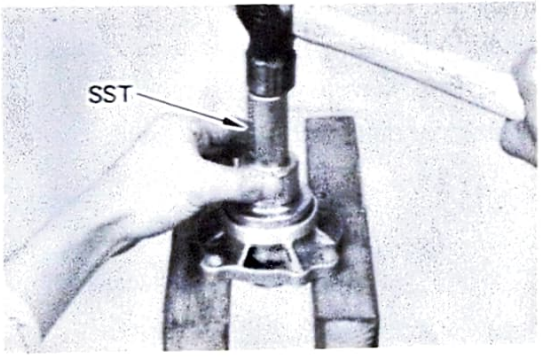


23. INSPECT FRONT DRIVE GEAR BEARING RETAINER

(a) Check the bearing retainer for damage or cracks.

(b) Check the oil seal for wear or damage.

If the oil seal is worn or damaged, replace it.

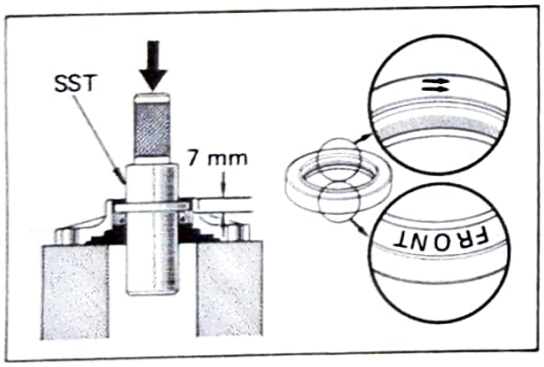


24. IF NECESSARY REPLACE OIL SEAL

(a) Using a transmission oil plug*, drive out the front drive gear oil seal and dust seal.

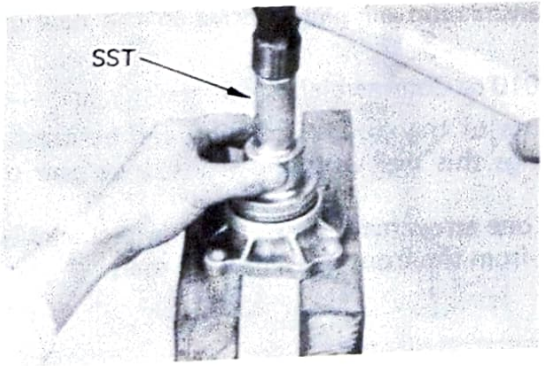
*SST 09325-20010 or Commercial driver

NOTE: Place the bearing retainer on something soft such as wooden blocks.

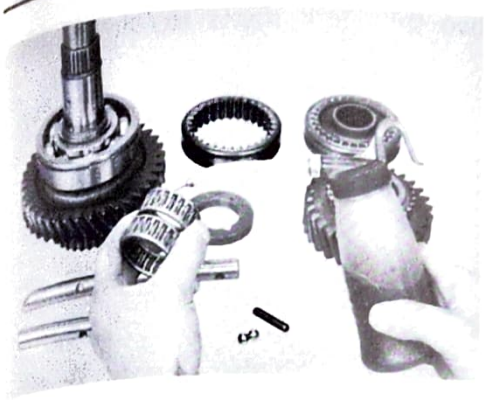


(b) Using a transmission oil plug*, drive in the new oil seal to a depth of 7 mm (0.28 in.) from the end.

NOTE: Take note of the groove direction and be careful not to interchange this seal with the output shaft oil seal. This oil seal has two arrow marks pointing clockwise and the word FRONT to distinguish it from the output shaft oil seal.

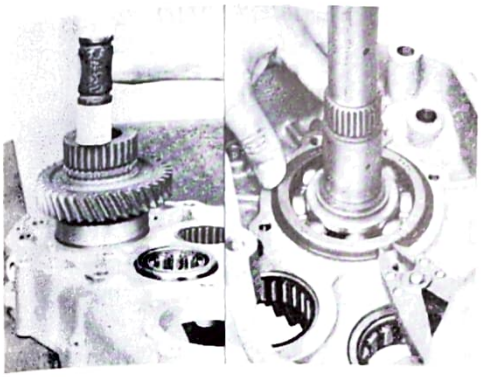


(c) Using a transmission oil plug*, drive in the new dust seal.



ASSEMBLY OF TRANSFER
(See illustration on page 11-5)

1. APPLY GEAR OIL TO BEARINGS, GEARS AND SHAFTS

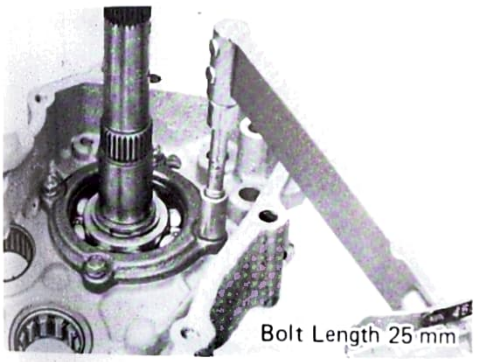


2. INSTALL OUTPUT SHAFT TO FRONT CASE

(a) Using a plastic hammer, install the output shaft to the front case.

NOTE: Place the front case on something soft such as wooden blocks.

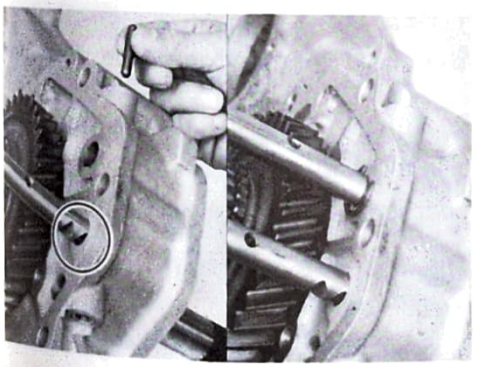
(b) Using snap ring pliers, install the snap ring.



3. INSTALL BEARING RETAINER

Install the bearing retainer and torque the mounting bolts.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

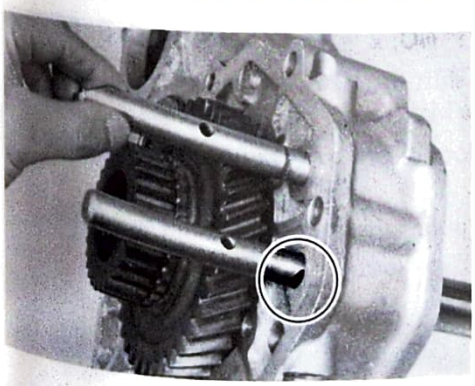


4. INSTALL SHIFT FORK SHAFTS AND INTERLOCK PIN

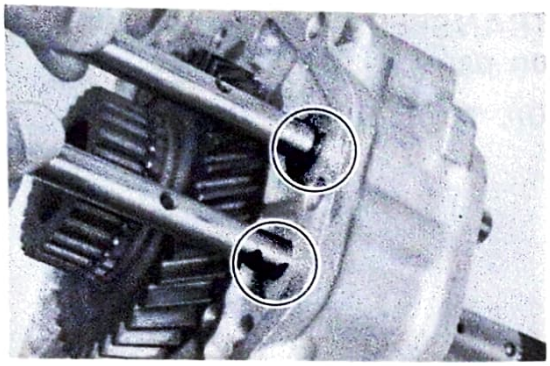
(a) Install the high-low shift fork shaft with the three grooves facing outside and align the interlock groove with the interlock pin hole.

(b) Install the interlock pin.

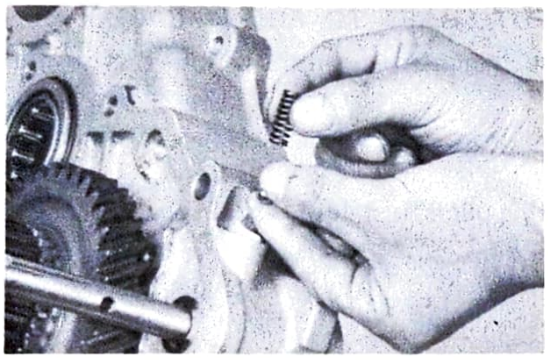
(c) Install the front drive shift fork shaft with the two grooves facing outside.



(d) Verify the front drive shift fork shaft does not move when the high–low shift fork shaft is shifted to the neutral or low speed position.

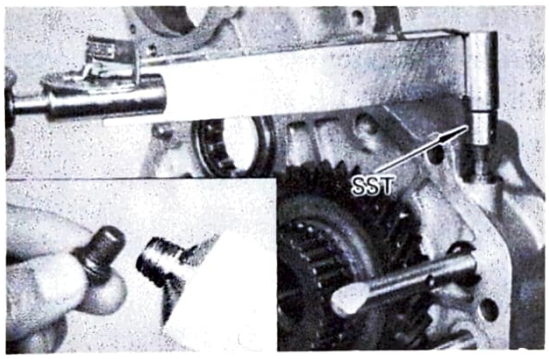


(e) Shift the two shift fork shafts to the high–two position.



5. INSTALL TWO BALLS, SPRINGS AND PLUGS

(a) Install the ball and spring.



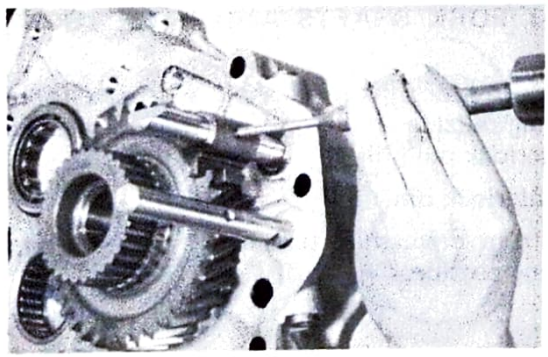
(b) Apply liquid sealer to the plug.

(c) Using an Allen wrench*, tighten the plug.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

*SST 09313-30020 or Commercial wrench

(d) Install the ball, spring and plug to the opposite side.

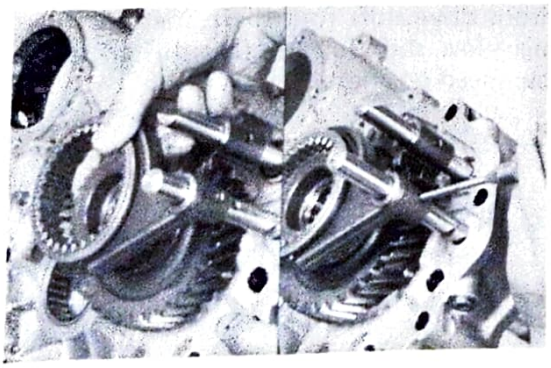


6. INSTALL SHIFT HEAD

(a) Install the shift head to the front drive shift fork shaft.

(b) Align the slotted spring pin hole in the shift head with the hole in the shaft.

(c) Using a pin punch, drive in the slotted spring pin.

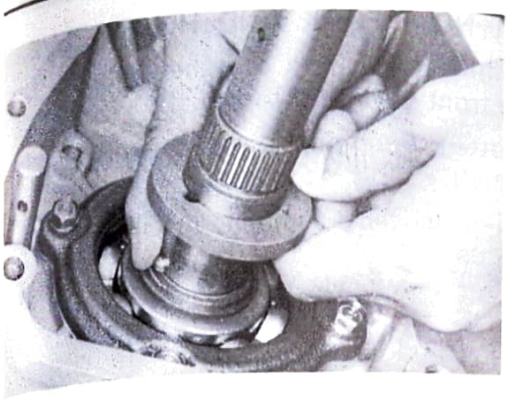


7. INSTALL SHIFT NO. 2 FORK AND HUB SLEEVE

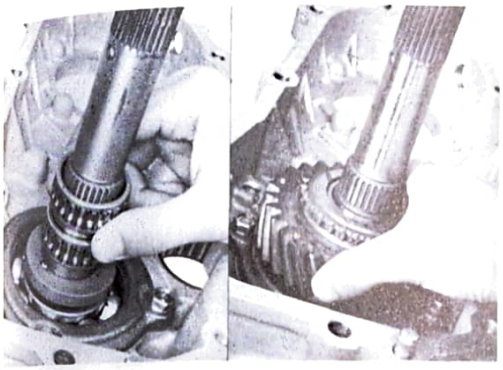
(a) Install the shift No. 2 fork together with the hub sleeve to the high–low shift fork shaft.

(b) Align the slotted spring hole in the fork with the hole in the shaft.

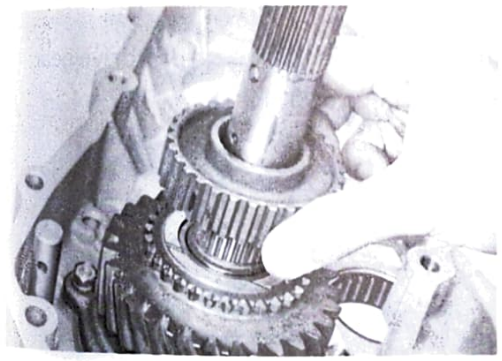
(c) Using a pin punch, drive in the slotted spring pin.



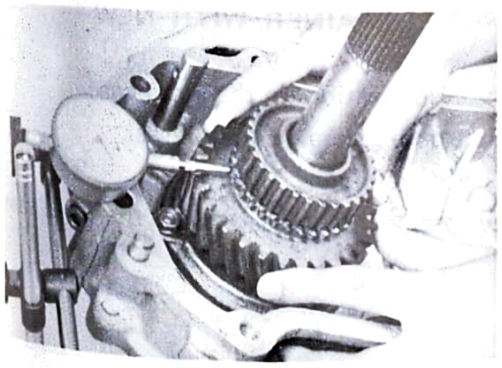
8. INSTALL LOCK BALL AND SPACER



9. INSTALL NEEDLE ROLLER BEARINGS AND TRANSFER DRIVE GEAR



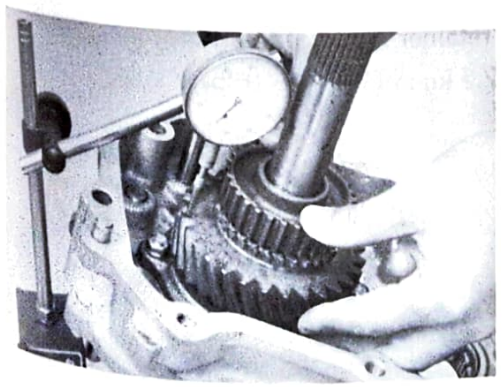
10. INSTALL CLUTCH HUB



11. INSPECT TRANSFER DRIVE GEAR OIL CLEARANCE AND THRUST CLEARANCE

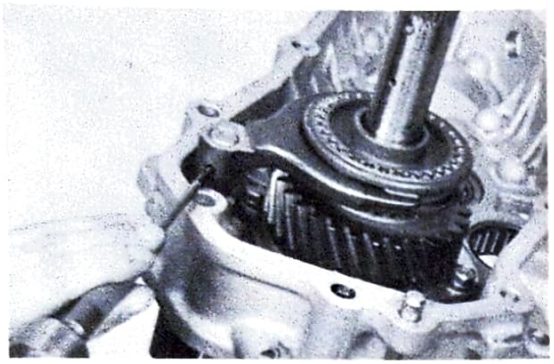
(a) Using a dial indicator, check the transfer drive gear oil clearance.

Standard clearance: 0.009 – 0.051 mm (0.0004 – 0.0020 in.)
Maximum clearance: 0.071 mm (0.0028 in.)



(b) Using a dial indicator, check the transfer drive gear thrust clearance.

Standard clearance: 0.09 – 0.27 mm (0.0035 – 0.0106 in.)
Maximum clearance: 0.32 mm (0.0126 in.)

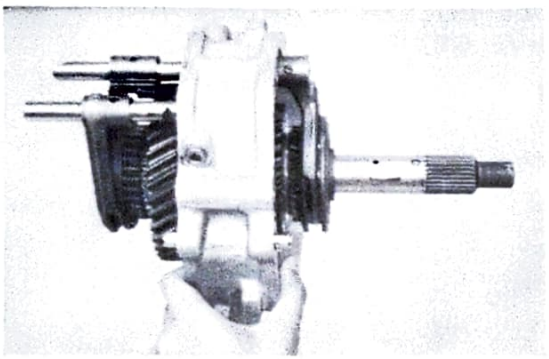


12. INSTALL SHIFT NO. 1 FORK AND HUB SLEEVE

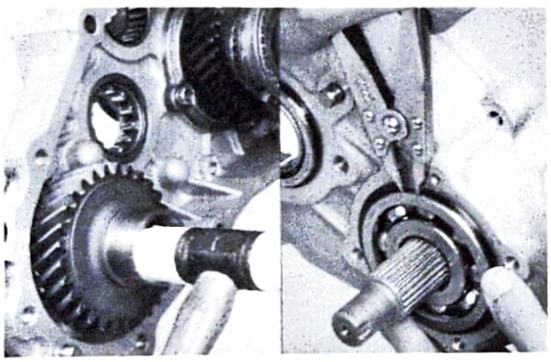
(a) Install the shift No. 1 fork together with the hub sleeve to the front drive shift fork shaft.

(b) Align the slotted spring pin hole in the fork with the hole in the shaft.

(c) Using a pin punch and hammer, install the slotted spring pin.



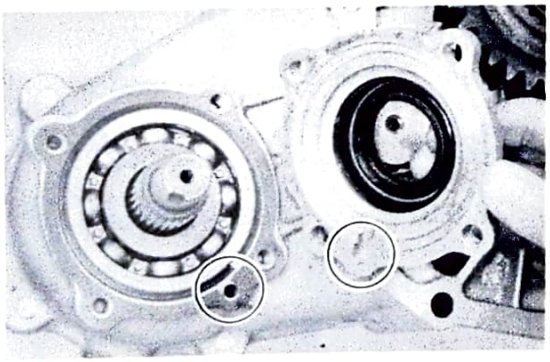
NOTE: Hold the front case so the rear is not lowered. If it is lowered, the clutch hub and steel ball may fall out.



13. INSTALL FRONT DRIVE GEAR

(a) Using a plastic hammer, install the front drive gear.

(b) Using snap ring pliers, install the snap ring.



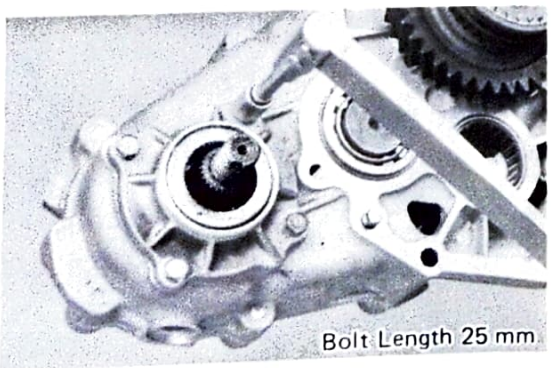
14. INSTALL BEARING RETAINER WITH NEW GASKET

(a) Place the gasket in position on the front case.

(b) Apply multipurpose grease on the oil seal.

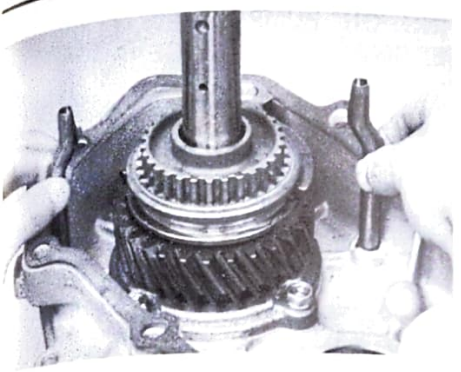
(c) Install the bearing retainer.

NOTE: Align the retainer oil passage with the front case oil hole.



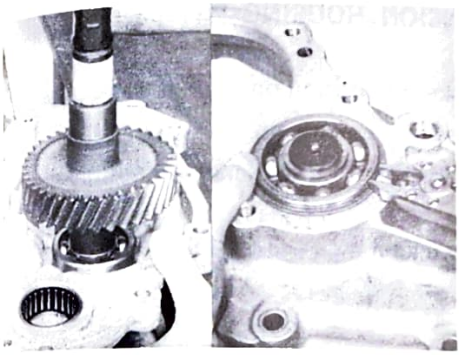
(d) Torque the retainer mounting bolts.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



15. INSTALL OIL PIPES

Install the two oil pipes with the cutout sides positioned upward.

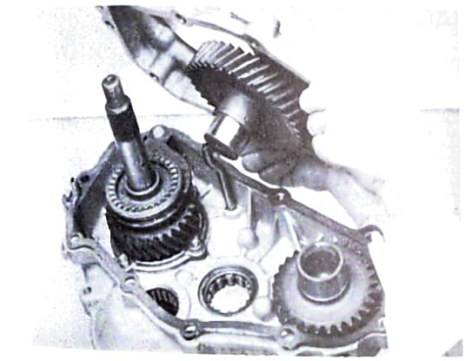


16. INSTALL IDLER GEAR TO REAR CASE

(a) Using a plastic hammer, install the idler gear to the rear case.

NOTE: Place the rear case on something soft such as wooden blocks.

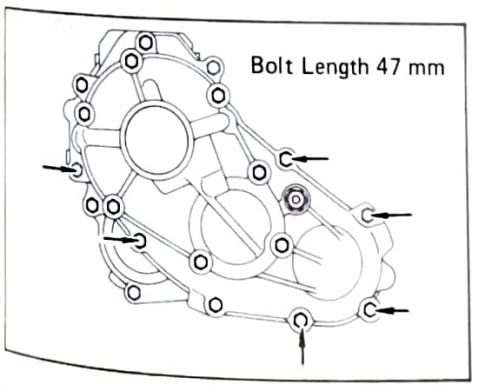
(b) Using snap ring pliers, install the snap ring.



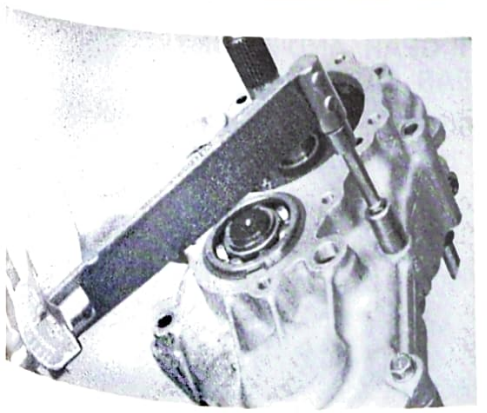
17. INSTALL REAR CASE WITH NEW GASKET

(a) Place the gasket in position on the front case.

(b) Install the rear case together with the idler gear.

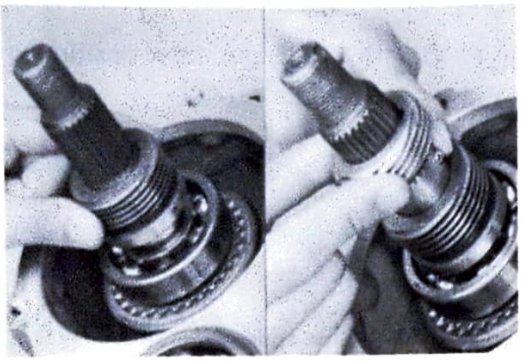


(c) Install the rear case mounting bolts in the positions shown in the figure.

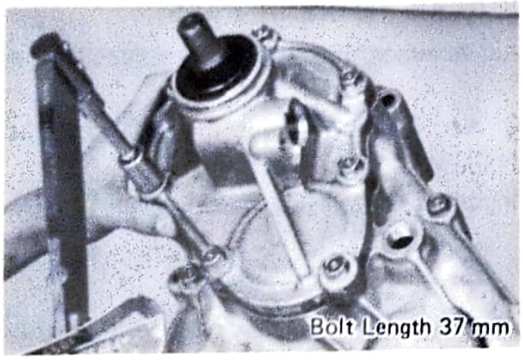


(d) Torque the rear case mounting bolts.

Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)



18. INSTALL BEARING, OIL PUMP SCREW, LOCKING BALL AND SPEEDOMETER DRIVE GEAR



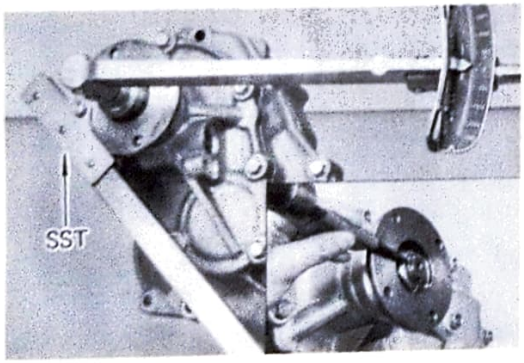
19. INSTALL EXTENSION HOUSING WITH NEW GASKET

(a) Place the gasket in position on the rear case.

(b) Apply multipurpose grease on the two oil seals.

(c) Install the extension housing and torque the mounting bolts.

Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)



20. INSTALL COMPANION FLANGE

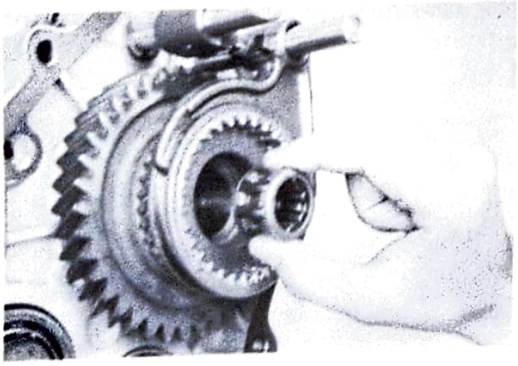
(a) Install the companion flange to the output shaft.

(b) Using a holder* to hold the flange, tighten the nut. Torque the nut.

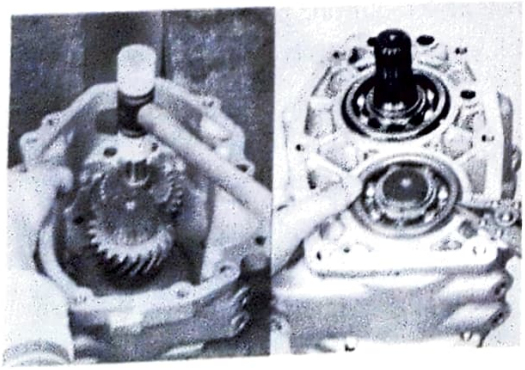
Torque: 11.0 – 14.0 kg-m (80 – 101 ft-lb)

*SST 09330-00020 or Commercial holder

(c) Stake the nut.



21. INSTALL ROLLER BEARING IN OUTPUT SHAFT

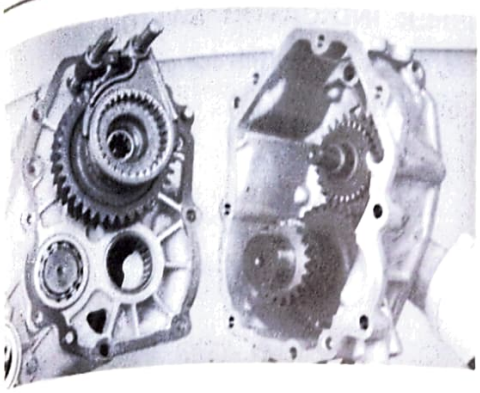


22. INSTALL INPUT GEAR AND COUNTER GEAR TO REDUCTION GEAR CASE

(a) Using a plastic hammer, install the input gear and counter gear to the reduction gear case.

NOTE: Place the reduction gear case on something soft such as wooden blocks.

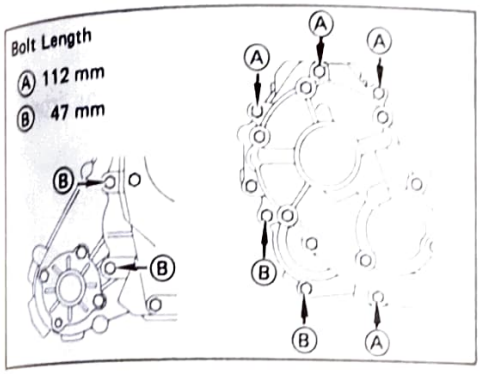
(b) Using snap ring pliers, install the snap rings.



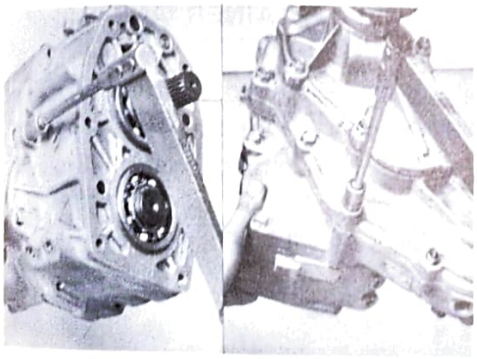
23. INSTALL REDUCTION GEAR CASE WITH NEW GASKET

(a) Place the gasket in position on the front case.

(b) Install the reduction gear case together with the input gear and counter gear.

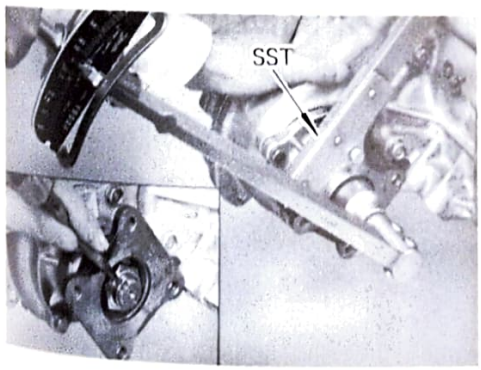


(c) Install the reduction gear case mounting bolts in the positions shown in the figure.



(d) Torque the reduction gear case mounting bolts.

Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)



24. INSTALL COMPANION FLANGE

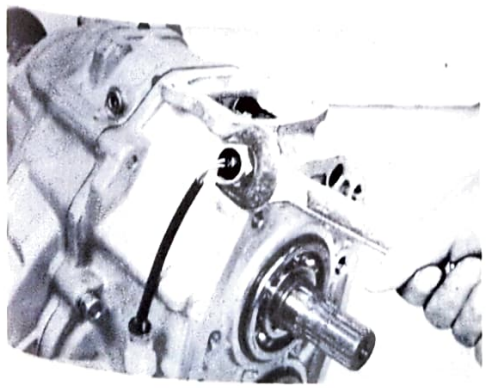
(a) Install the companion flange to the front drive gear.

(b) Using a holder* to hold the flange, tighten the nut. Torque the nut.

Torque: 11.0 – 14.0 kg-m (80 – 101 ft-lb)

*SST 09330-00020 or Commercial holder

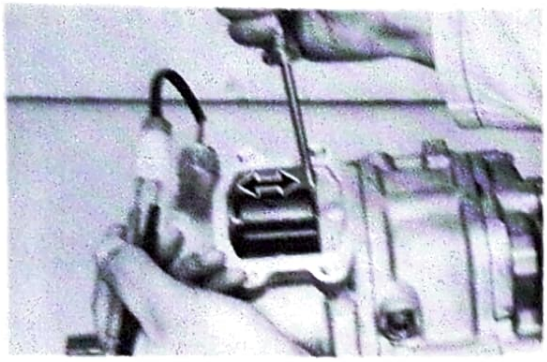
(c) Stake the nut.



25. INSTALL TRANSFER INDICATOR SWITCH WITH WASHER

Tighten the indicator switch.

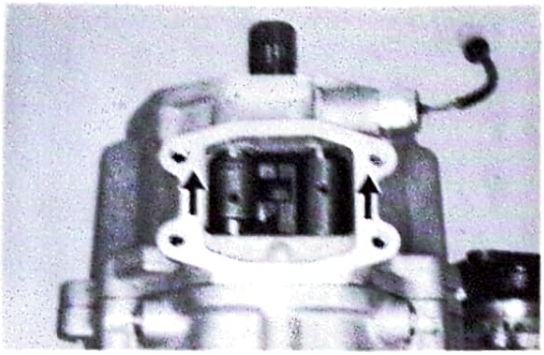
Torque: 3.0 – 5.0 kg-m (22 – 36 ft-lb)



26. INSPECT TRANSFER INDICATOR SWITCH

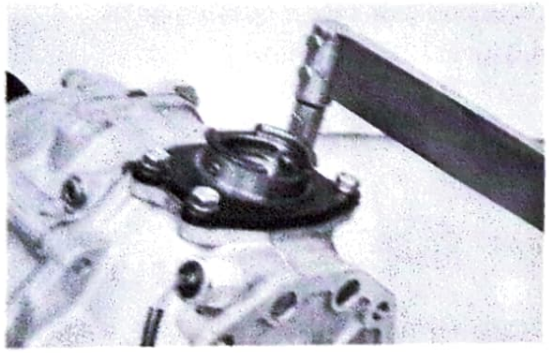
Using an ohmmeter, check the switch for continuity.

If no continuity, replace the switch.



27. SHIFT TWO SHIFT FORKS TO HIGH-FOUR POSITION

Using a screwdriver, shift the two shift forks to the front.

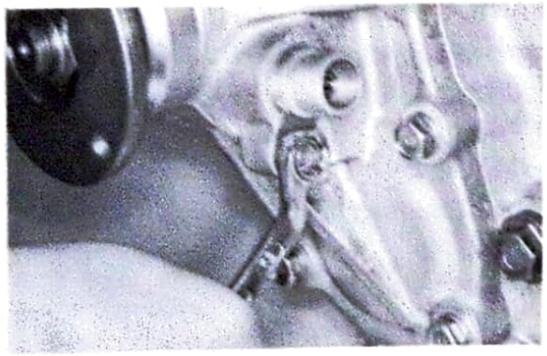


28. INSTALL SHIFT LEVER RETAINER AND OIL DEFLECTOR WITH NEW GASKETS

(a) Place the oil deflector between the two gaskets and position them on the reduction gear case.

(b) Install the shift lever retainer and torque the mounting bolts.

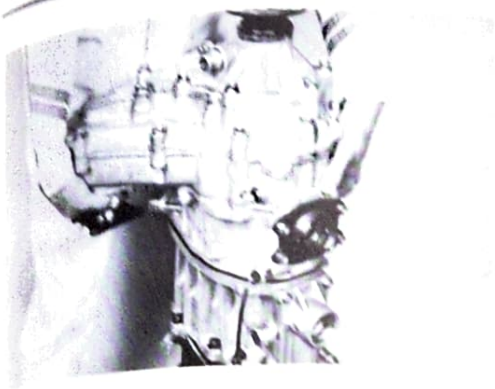
Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



29. INSTALL SPEEDOMETER DRIVEN GEAR

Secure the gear with the lock plate and bolt. Torque the bolt.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



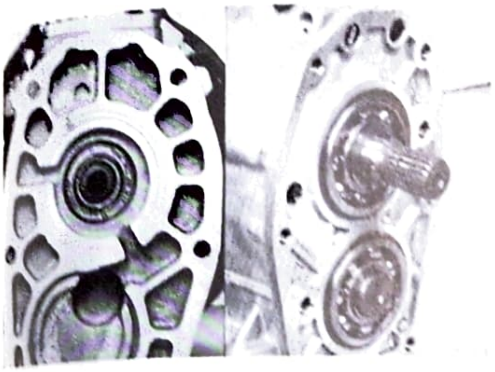
INSTALLATION OF TRANSFER

1. INSTALL TRANSFER TO TRANSMISSION WITH NEW GASKET

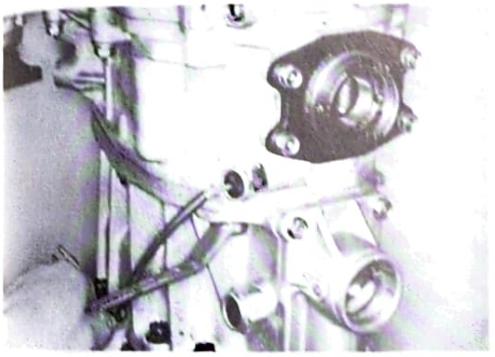
   (a) Apply multipurpose grease on the adapter rear oil seal.

   (b) Place the gasket in position on the adapter.

   (c) Insert the transfer input gear straight into the adapter rear oil seal and install the transfer to the transmission.

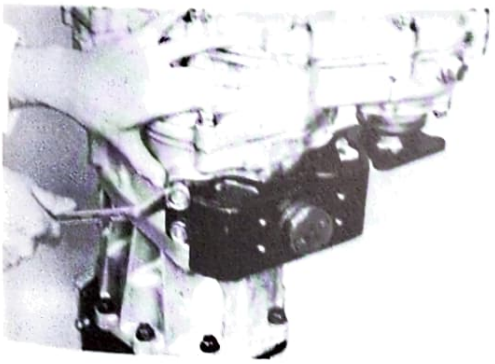


CAUTION: Take care not to damage the oil seal by the input gear spline when installing the transfer.



(d) Torque the mounting bolts.

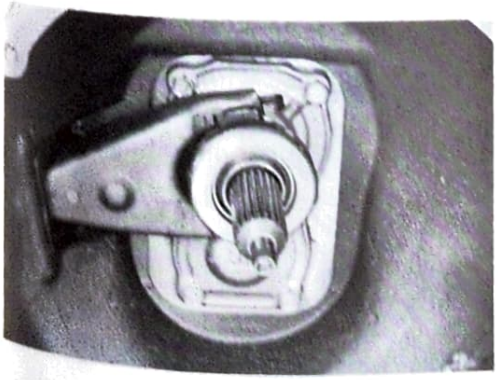
Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)



2. INSTALL ENGINE REAR MOUNTING

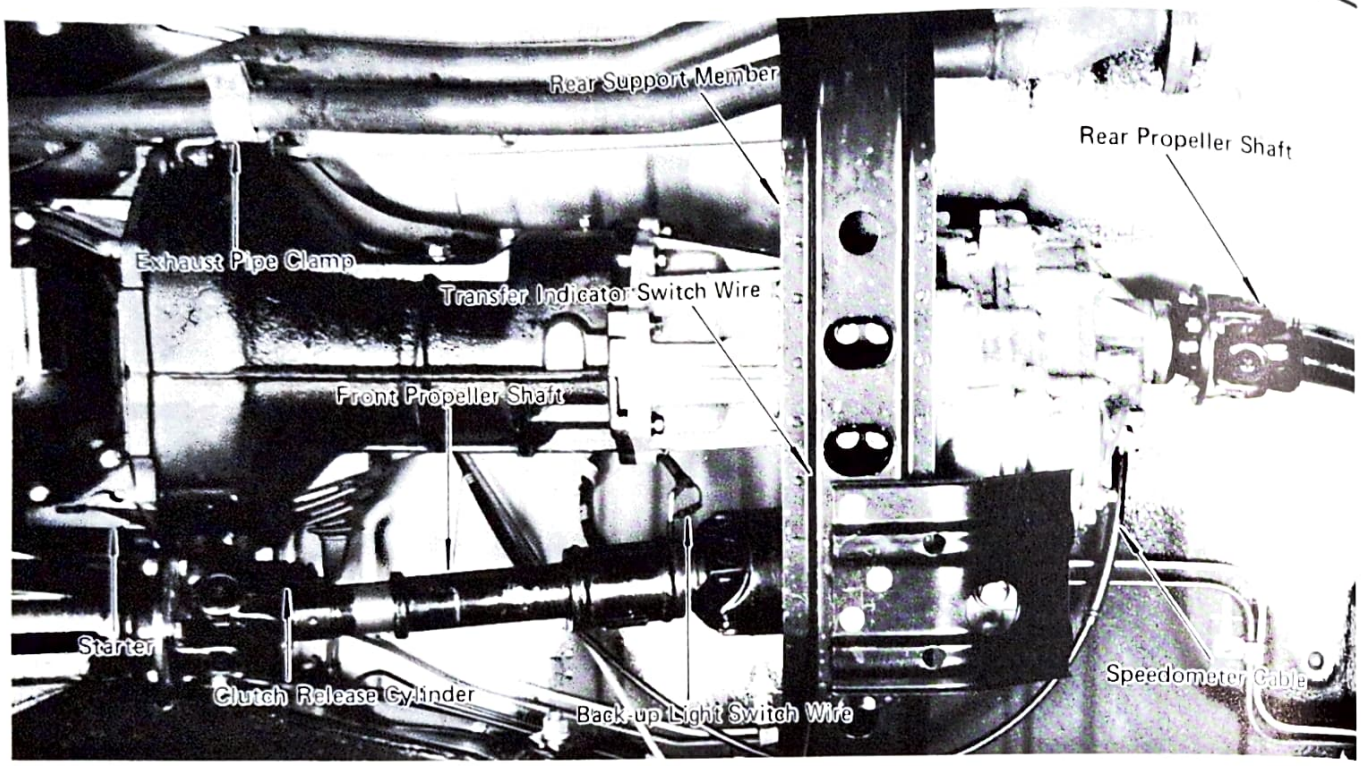
Install and torque the mounting bolts.

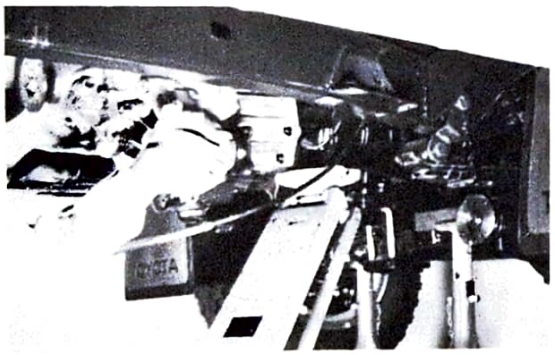
Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



3. APPLY GREASE TO FOLLOWING AREAS

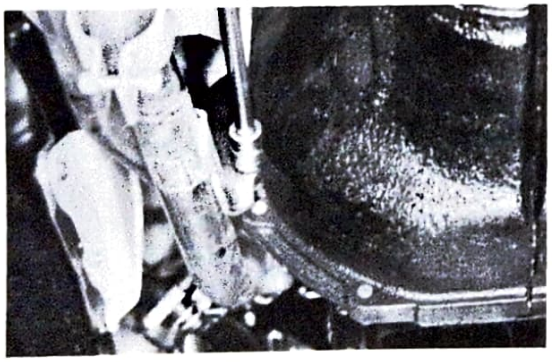
Area	Grease
Clutch disc spline Release bearing hub inside Release fork and hub contact points Release fork pivot point Release fork and push rod contact point	Molybdenum disulphide lithium base, NLGI No.2
Release bearing front	Lithium base multi-purpose, NLGI No.2





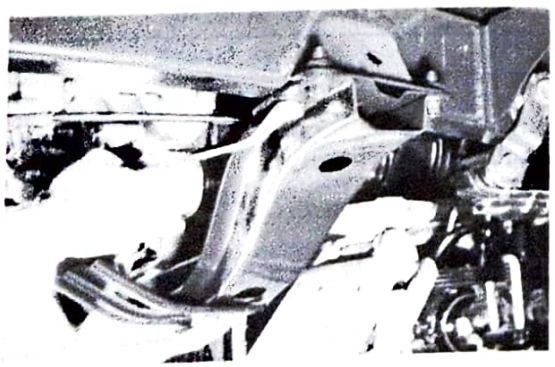
4. INSTALL TRANSMISSION AND TRANSFER ASSEMBLY

(a) Support the transmission case with a jack and install the transmission and transfer assembly.



(b) Torque the transmission mounting bolts.

Torque: 5.0 – 8.0 kg-m (37 – 57 ft-lb)

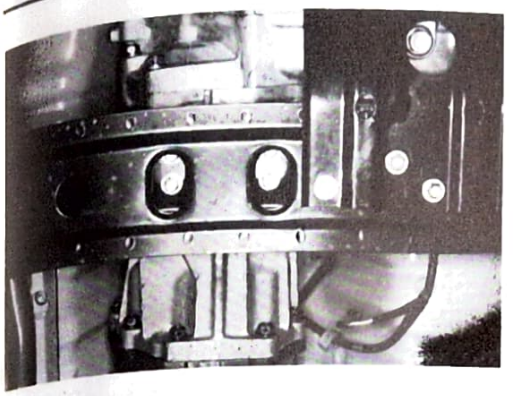


5. INSTALL REAR SUPPORT MEMBER

(a) Support the transmission case with a jack and install the rear support member to the frame.

(b) Torque the rear support member mounting bolts.

Torque: 7.5 – 10.5 kg-m (55 – 75 ft-lb)

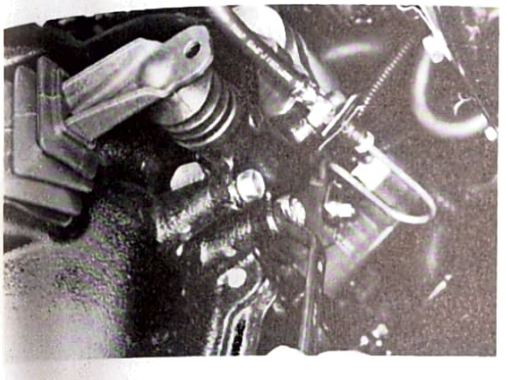


6. INSTALL TWO ENGINE REAR MOUNTING BOLTS TO REAR SUPPORT MEMBER
   (a) Remove the safty support under the engine, and lower the jack.
   (b) Torque the four mounting bolts.
   Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

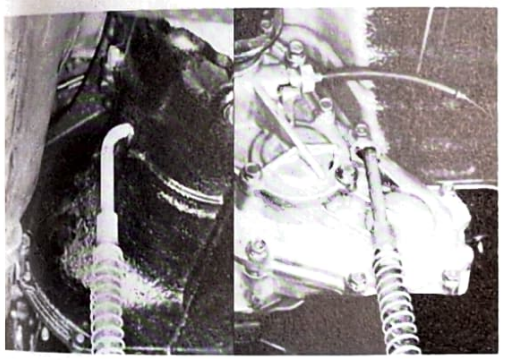
7. CONNECT EXHAUST PIPE CLAMP TO TRANSMISSION HOUSING

8. CONNECT BACK-UP LIGHT SWITCH WIRE AND TRANSFER INDICATOR SWITCH WIRE

9. CONNECT SPEEDOMETER CABLE
   Using pliers, tighten the collar.



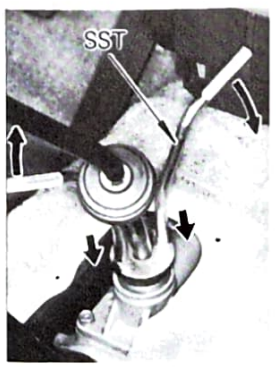
10. INSTALL STARTER AND CLUTCH RELEASE CYLINDER
    (a) Install the starter with the brake hose bracket.
    (b) Install the clutch release cylinder and connect the return spring.



11. INSTALL PROPELLER SHAFT (See page 12-8)

12. FILL TRANSMISSION AND TRANSFER WITH GEAR OIL
    Oil type: API GL-4 or GL-5
    SAE 80W-90
    Quantity:
    Transmission
    4-Speed 2.0 liters (2.1 USqts, 1.8 Imp.qts)
    5-Speed 1.8 liters (1.9 USqts, 1.6 Imp.qts)
    Transfer 1.6 liters (1.7 USqts, 1.4 Imp.qts)

13. LOWER VEHICLE AND INSTALL TRANSFER SHIFT LEVER
    (a) Apply multipurpose grease to the transfer shift lever.
    (b) Using pliers, install the transfer shift lever.



14. INSTALL TRANSMISSION SHIFT LEVER
    (a) Apply mulipurpose grease to the transmission shift lever.
    (b) Using SST*, install the transmission shift lever.
    *SST 09305-20012

15. PERFORM ROAD TEST
    Check for abnormal noise and smooth operation.

PROPELLER SHAFT

	Page
TROUBLESHOOTING	12-2
SPECIAL TOOLS AND TEST EQUIPMENT	12-2
PROPELLER SHAFT	12-2

TROUBLESHOOTING

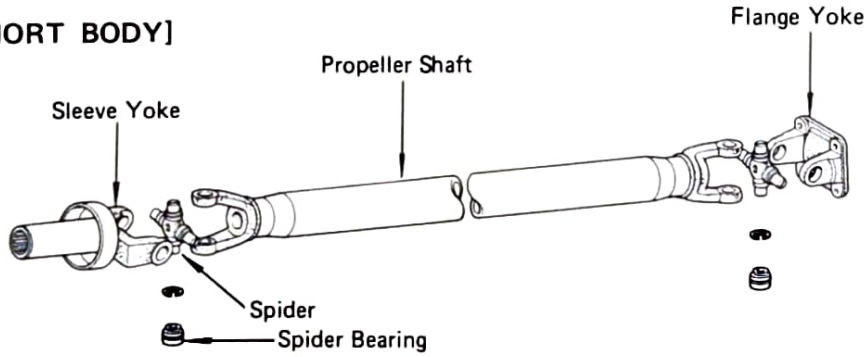
Problem	Possible cause	Remedy	Page
Noise	Sleeve yoke spline worn	Replace sleeve yoke	12-4
	Center bearing worn	Replace center bearing	12-4
	Spider bearing worn or stuck	Replace spider bearing	12-6
Vibration	Propeller shaft runout	Replace propeller shaft	12-3
	Propeller shaft unbalance	Balance propeller shaft	
	Transmission extension housing rear bushing worn	Replace bushing	9-35
	Sleeve yoke spline stuck	Replace sleeve yoke	12-4

SPECIAL TOOLS AND TEST EQUIPMENT

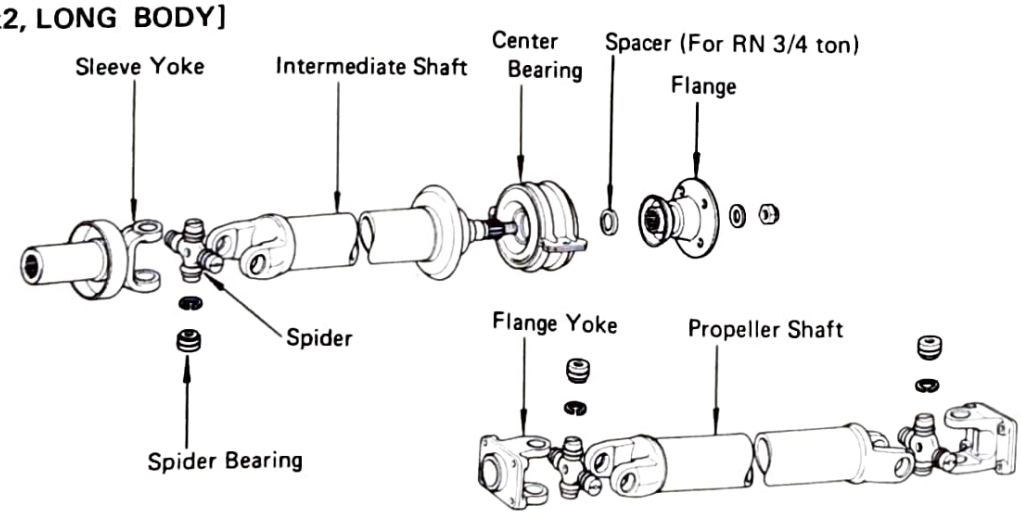
Tool	SST No.	Use
Transmission oil plug	09325-20010 or Commercial	To insert in transmission
Companion flange holder	09330-00020 or Commercial	To remove and install center bearing flange
Universal joint bearing replacer	09332-25010	To remove and install bearing outer race

PROPELLER SHAFT

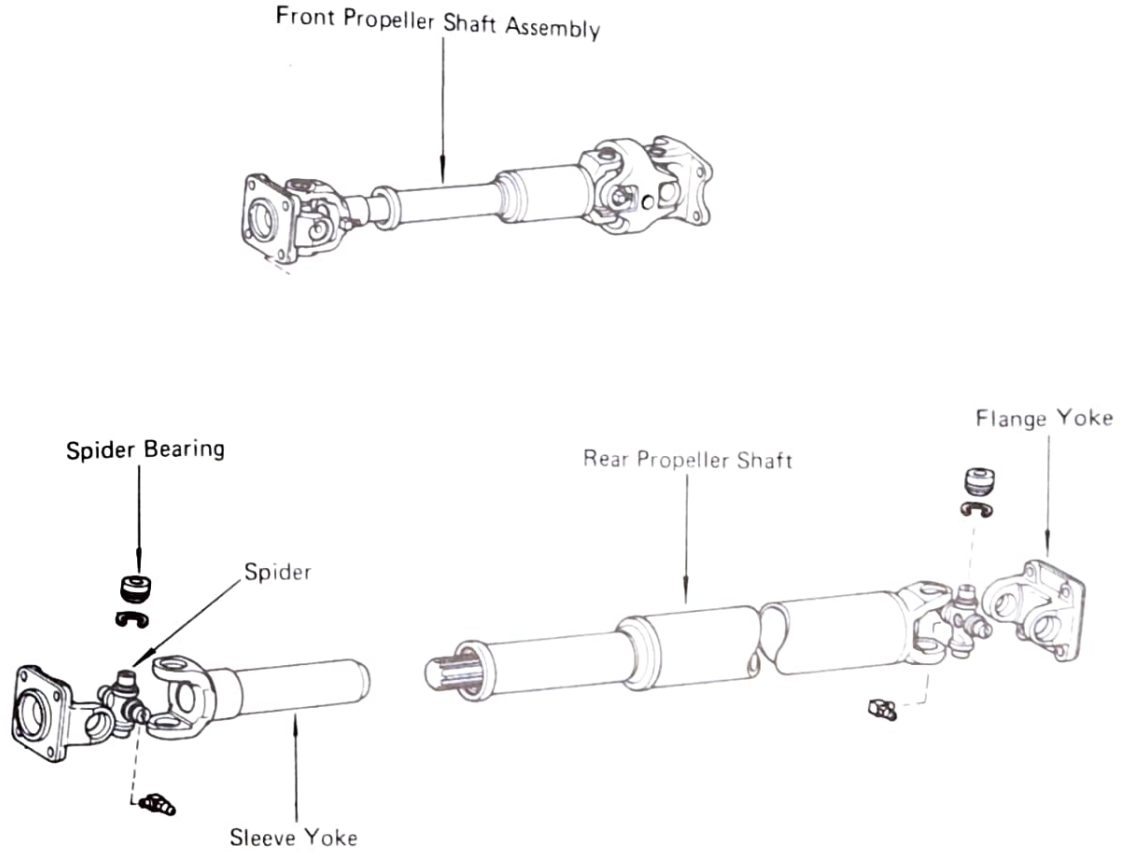
[RN 4x2, SHORT BODY]

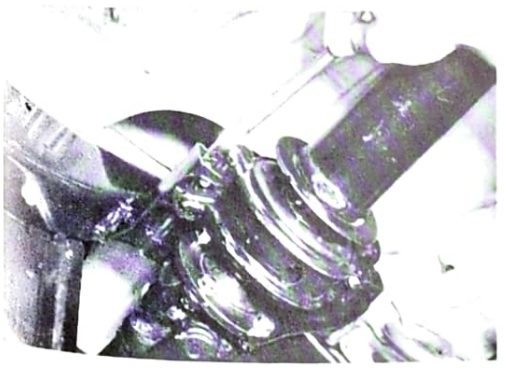


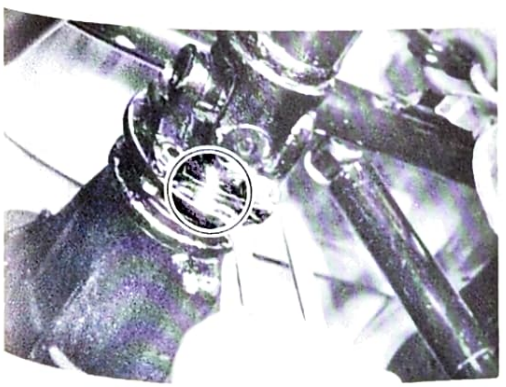
[RN 4x2, LONG BODY]



[RN 4x4]





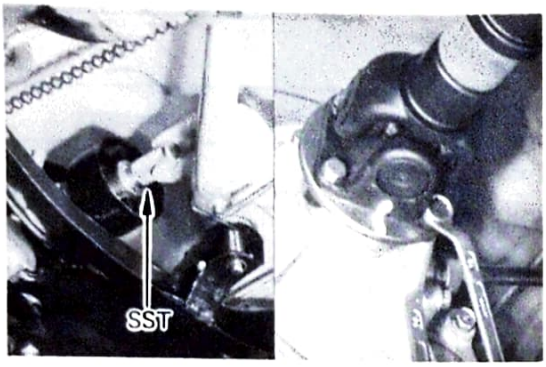


REMOVAL AND DISASSEMBLY OF PROPELLER SHAFT

CAUTION: Do not disassemble the front propeller shaft of RN 4x4.

1. REMOVE TWO BOLTS HOLDING CENTER SUPPORT BEARING TO FRAME (THREE-JOINT TYPE)

2. DISCONNECT PROPELLER SHAFT FLANGE FROM FLANGE ON DIFFERENTIAL
   (a) Put alignment marks on the flanges.
   (b) Remove four bolts and nuts.

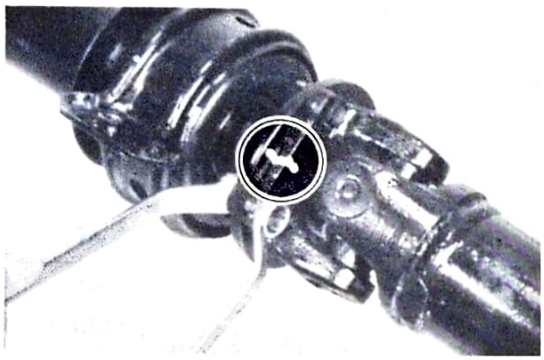


3. PULL PROPELLER SHAFT OUT OF TRANSMISSION (RN 4x2)

(a) Pull the yoke from the transmission.

(b) Insert a transmission oil plug* in the transmission to prevent oil leakage.

*SST 09325-20010 or Commercial plug



4. DISCONNECT PROPELLER SHAFT FLANGE FROM FLANGE ON TRANSFER (RN 4x4)

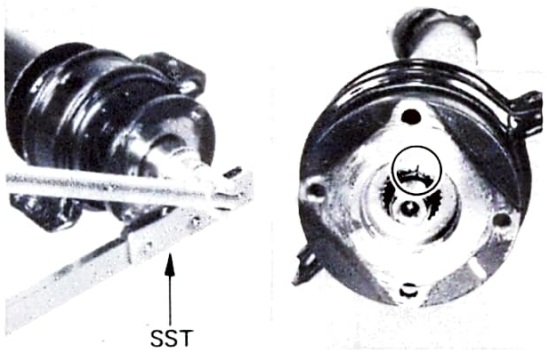
(a) Put alignment marks on the flanges.

(b) Remove four bolts and nuts.

5. SEPARATE PROPELLER SHAFT AND INTERMEDIATE SHAFT (THREE-JOINT TYPE)

(a) Put alignment marks on the flanges.

(b) Remove four bolts and nuts.



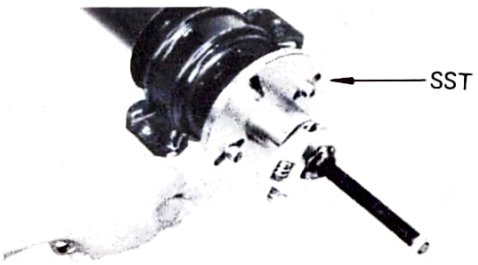
6. REMOVE CENTER SUPPORT BEARING FROM INTERMEDIATE SHAFT (THREE-JOINT TYPE)

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using a holder* to hold the flange, remove the nut.

*SST 09330-00020 or Commercial holder

(c) Put alignment marks on the flange and shaft.



(d) Using a flange remover*, remove the flange from the shaft.

*SST 09557-22022

(e) Remove the center support bearing from the shaft.

7. REMOVE SLEEVE YOKE FROM PROPELLER SHAFT (REAR PROPELLER SHAFT OF RN 4x4)

(a) Put alignment marks on the sleeve yoke and shaft.

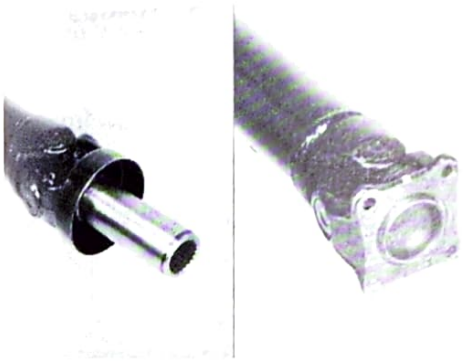
(b) Pull out the sleeve yoke from the shaft.

INSPECTION OF PROPELLER SHAFT COMPONENTS

1. INSPECT PROPELLER AND INTERMEDIATE SHAFTS FOR DAMAGE AND RUNOUT

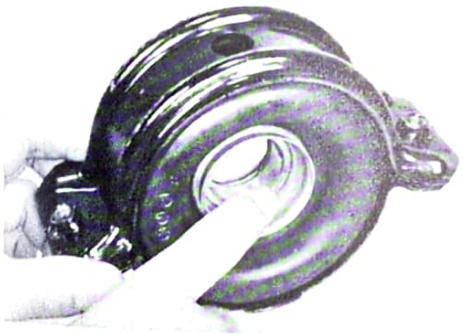
If shaft runout is greater than maximum, replace the shaft.

Maximum runout: 0.8 mm (0.031 in)



2. INSPECT YOKE AND FLANGES FOR DAMAGE AND WEAR

Replace if damaged or worn.



3. INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE

Check that the bearing turns freely.

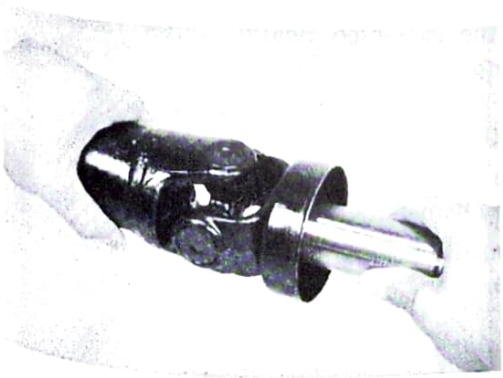
If the bearing is damaged, worn, or does not turn freely, replace it.

4. INSPECT FRONT PROPELLER SHAFT

(a) Inspect the shaft for wear or damage.

(b) Inspect the double Cardan joint for wear or damage.

NOTE: If any problem is found, replace the front propeller shaft assembly.



5. INSPECT SPIDER BEARINGS

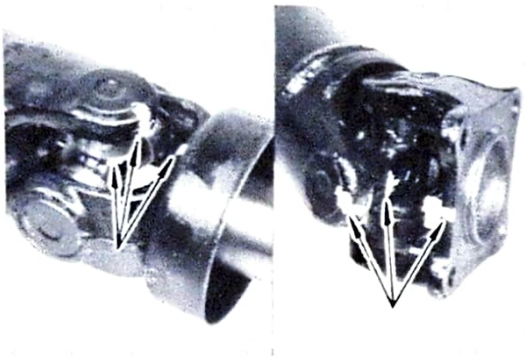
(a) Inspect the spider bearings for wear or damage.

(b) Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

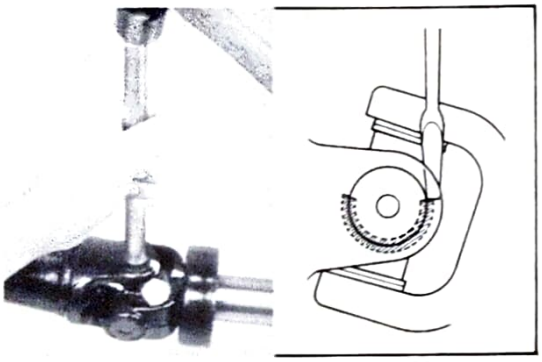
Bearing axial play: Less than 0.05 mm (0.0020 in.)

If necessary, replace the spider bearing.

REPLACEMENT OF SPIDER BEARING



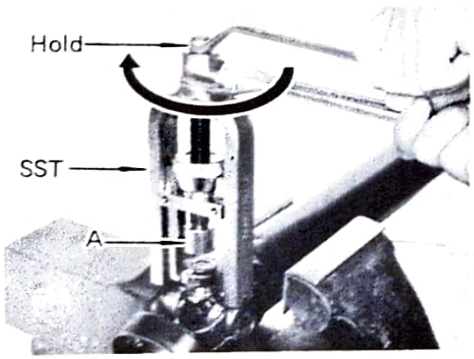
1. PUT ALIGNMENT MARKS ON SHAFT, SPIDER AND YOKE OR FLANGE



2. SLIGHTLY TAP IN BEARING OUTER RACES

3. REMOVE SNAP RINGS

Using a screwdriver, remove four snap rings from the grooves.

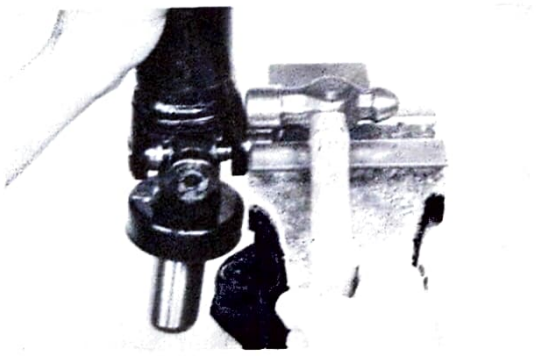


4. REMOVE SPIDER BEARINGS

(a) Using SST*, push out the bearing from the propeller shaft.

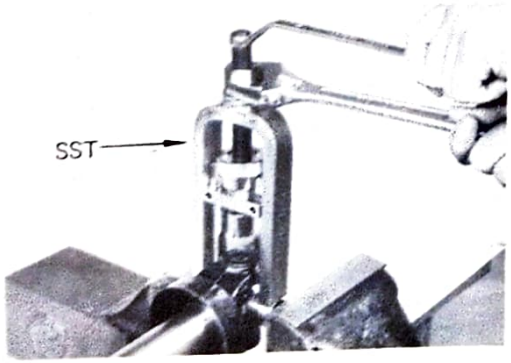
*SST 09332-25010

NOTE: Sufficiently raise the part indicated by A so that it does not come into contact with the bearing.



(b) Clamp the outer bearing race in a vise and tap off the propeller shaft with a hammer.

NOTE: Remove the bearing on the opposite side by the same procedure.

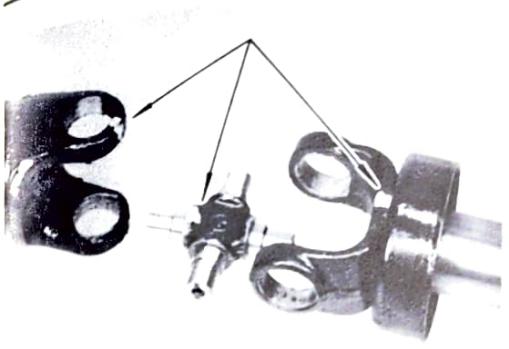


(c) Assemble the extracted bearing outer races to the spider and push out the bearing from the yoke with SST*.

*SST 09332-25010

(d) Clamp the outer bearing race in a vise and tap off the yoke with a hammer.

NOTE: Remove the bearing on the opposite side by the same procedure.



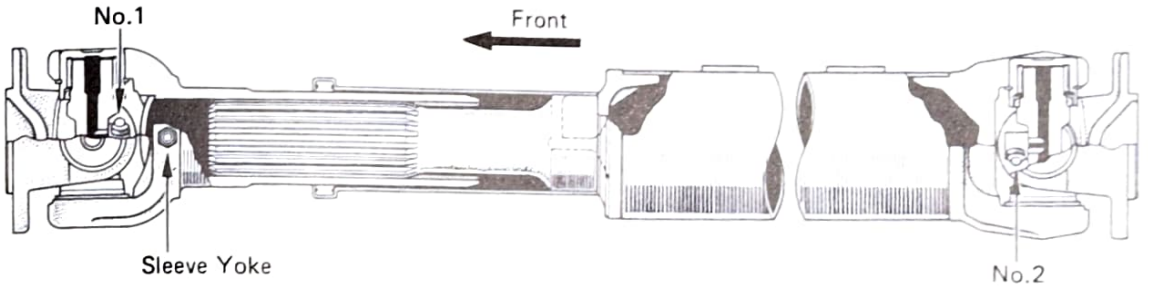
5. INSTALL SPIDER BEARINGS

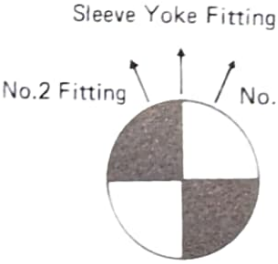
(a) Apply multipurpose grease to the spider and bearings.

(b) Align the marks on the yoke, spider and shaft.

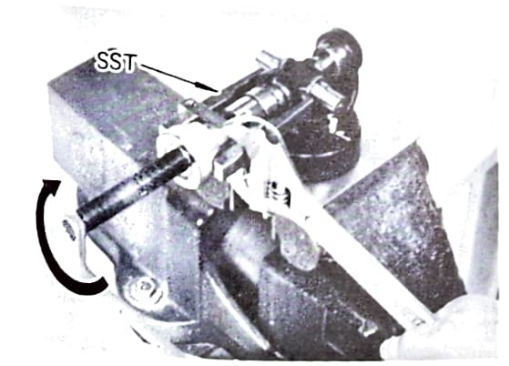
NOTE: When replacing the rear propeller shaft spider of RN 4x4, be sure that the grease fitting assembly hole is facing in the direction shown in the figure.

SPIDER GREASE FITTING ASSEMBLY DIRECTION FOR RN 4x4 REAR PROPELLER SHAFT





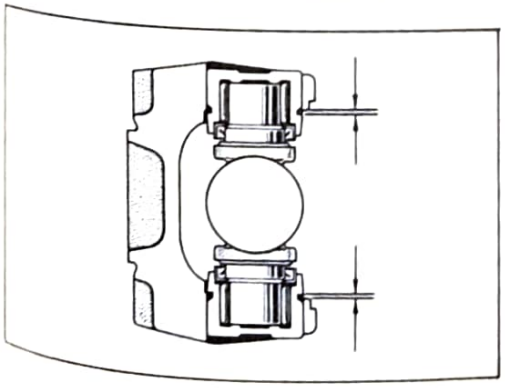
The figure at left shows the locations of the grease fittings as seen from the rear.



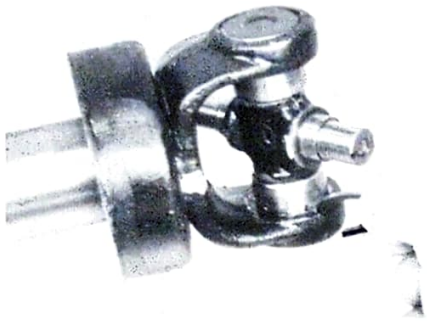
(c) Fit the spider in the yoke.

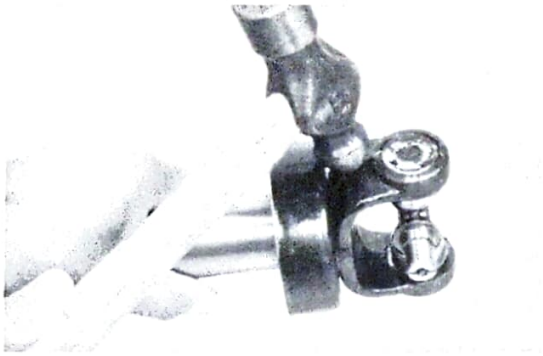
(d) Using SST*, install the new bearings on the spider.

*SST 09332-25010



(e) Using SST, adjust the both bearings so that snap ring grooves are at maximum and equal widths.





6. INSTALL SNAP RINGS

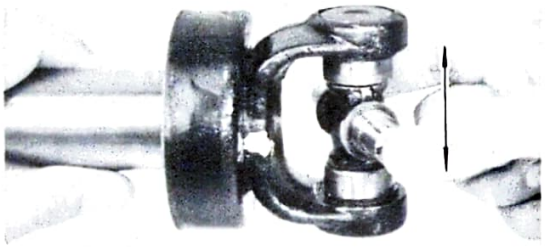
(a) Install two snap rings of the same thickness, which will allow 0 – 0.05 mm (0 – 0.0020 in.) axial play.

NOTE: Do not reuse the snap rings.

Thickness of snap ring

Model	Part No.	Thickness mm (in.)	Color
1/2 ton and 4x4	90520-26233	1.475 – 1.525 (0.0581 – 0.0600)	–
	90520-26234	1.525 – 1.575 (0.0600 – 0.0620)	Brown
	90520-26235	1.575 – 1.625 (0.0620 – 0.0640)	Blue
3/4 ton and C&C	90521-29070	2.375 – 2.425 (0.0935 – 0.0955)	–
	90521-29071	2.425 – 2.475 (0.0955 – 0.0974)	Brown
	90521-29072	2.475 – 2.525 (0.0974 – 0.0994)	Blue

(b) Using a hammer, tap the yoke until the clearance between the bearing outer race and snap ring is zero.



7. CHECK SPIDER BEARING

(a) Check that the spider bearing moves smoothly.

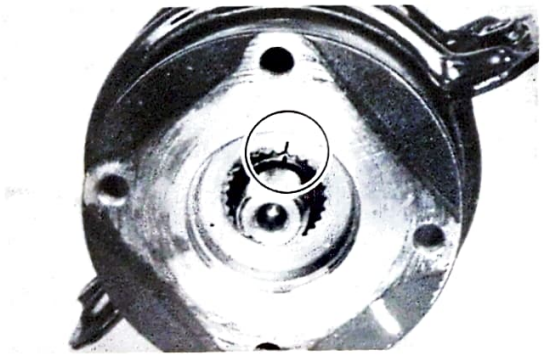
(b) Check the spider bearing axial play.

Bearing axial play: Less than 0.05 mm (0.0020 in.)

NOTE: Install the new spider bearings in the shaft side using the procedure above.

ASSEMBLY AND INSTALLATION OF PROPELLER SHAFT

(See illustration on page 12-2)



1. INSTALL CENTER SUPPORT BEARING ON INTERMEDIATE SHAFT (THREE-JOINT TYPE)

(a) Coat the splines of the intermediate shaft with multipurpose grease.

(b) Place the flange on the shaft and align the marks.

NOTE: For RN 3/4 ton, install the spacer to the back side of the bearing before installing the flange.

(c) Using a holder* to hold the flange, tighten a new nut to press the bearing into position.

Torque: 17.0 – 20.0 kg-m (123 – 144 ft-lb)

*SST 09330-00020 or Commercial holder

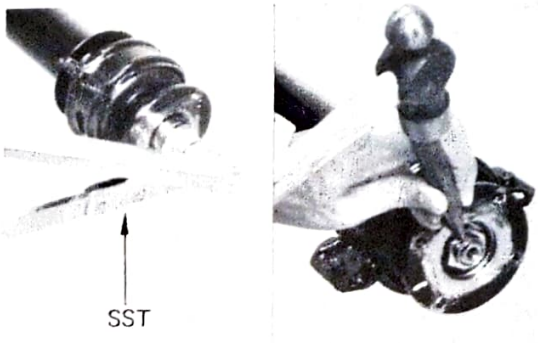
(d) Loosen the nut.

(e) Torque the nut again.

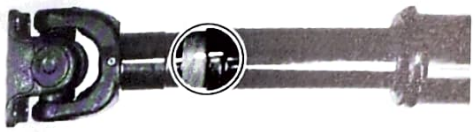
Torque:

RN 1/2 ton 2.5 – 3.5 kg-m (19 – 25 ft-lb)
RN 3/4 ton, RN C&C 3.0 – 4.0 kg-m (22 – 28 ft-lb)

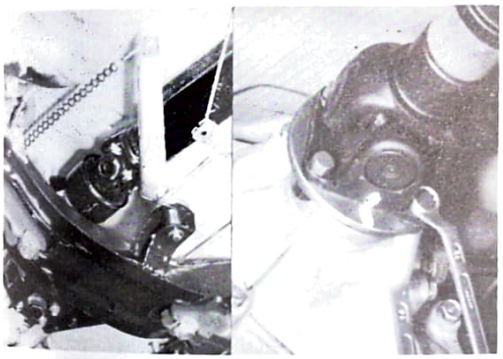
(f) Using a hammer and punch, stake the nut.



2. INSTALL PROPELLER SHAFT ON CENTER SUPPORT BEARING FLANGE (THREE-JOINT TYPE)
   (a) Align the marks on the flanges and connect the flanges with four bolts and nuts.
   (b) Torque the bolts and nuts.
   Torque: 3.0 – 5.0 kg-m (22 – 36 ft-lb)



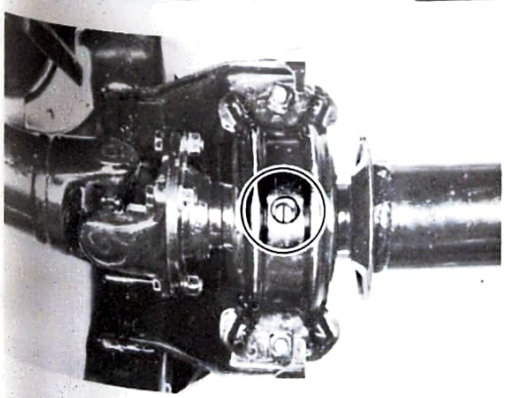
3. INSERT SLEEVE YOKE INTO PROPELLER SHAFT (REAR PROPELLER SHAFT OF RN 4x4)
   (a) Apply multipurpose grease to the propeller shaft spline and sleeve yoke sliding surface.
   (b) Align the marks on the sleeve yoke and propeller shaft.
   (c) Insert the sleeve yoke into the propeller shaft.



4. INSERT YOKE IN TRANSMISSION (RN 4x2)

5. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER (RN 4x4)
   (a) Align the marks on the flanges and connect the flanges with four bolts and nuts.
   (b) Torque the bolts and nuts.
   Torque: 3.0 – 5.0 kg-m (22 – 36 ft-lb)

6. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON DIFFERENTIAL
   (a) Align the marks on the flanges and connect the flanges with four bolts and nuts.
   (b) Torque the bolts and nuts.
   Torque: 3.0 – 5.0 kg-m (22 – 36 ft-lb)



7. CONNECT CENTER BEARING TO MEMBER (THREE-JOINT TYPE)
   (a) Finger tighten the two mounting bolts.
   (b) Check that the bearing bracket is at right angles to the propeller shaft and the bearing center line is in the center of the bracket hole.
   (c) Torque the mounting bolts.
   Torque: 1.5 – 2.0 kg-m (11 – 14 ft-lb)

FRONT AXLE AND SUSPENSION

(RN4 x 2)

	Page
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(RN4 x 4)

TROUBLESHOOTING	13-26
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TROUBLESHOOTING (RN4×2)

Problem	Possible cause	Remedy	Page
Wander/pulls	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	13-3
	Alignment incorrect	Check front end alignment	13-3
	Wheel bearing adjusted too tight	Adjust wheel bearing	13-9
	Front or rear suspension parts loose or broken	Tighten or replace suspension part	
	Steering linkage loosen or worn	Tighten or replace steering linkage	16-73
	Steering gear out of adjustment or broken	Adjust or repair steering gear	16-3
Bottoming	Vehicle overloaded	Check loading	
	Shock absorber worn out	Replace shock absorber	13-18
	Springs weak	Replace spring	13-13
Sways/pitches	Tires improperly inflated	Inflate tires to proper pressure	13-3
	Stabilizer bar bent or broken	Inspect stabilizer bar	13-16
	Shock absorber worn out	Replace shock absorber	13-18
Front wheel shimmy	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	13-3
	Wheels out of balance	Balance wheels	
	Shimmy damper worn out	Replace steering damper	16-76
	Shock absorber worn out	Replace shock absorber	13-18
	Alignment incorrect	Check front end alignment	13-3
	Wheel bearings worn or improperly adjusted	Replace or adjust wheel bearings	13-7
	Ball joints or bushings worn	Inspect ball joints and bushings	13-20, 22 24
	Steering linkage loosen or worn	Tighten or replace steering linkage	16-73
	Steering gear out of adjustment or broken	Adjust or repair steering gear	16-3
Abnormal tire wear	Tires improperly inflated	Inflate tires to proper pressure	13-3
	Shock absorbers worn out	Replace shock absorber	13-18
	Alignment incorrect	Check toe-in	13-6
	Suspension parts worn	Replace suspension part	

SPECIAL TOOLS AND TEST EQUIPMENT (RN4×2)

Tool	SST No.	Use
Wheel alignment equipment	Commercial	To check front end alignment
Flare nut wrench	09751-36011 or Commercial	To loosen and tighten brake line
Bearing driver	09608-30011 or Commercial	To install wheel bearing outer race
Ball joint puller	09628-62010 or Commercial	To disconnect ball joint
Ball joint puller	09610-20011 or Commercial	To disconnect ball joint
Bushing replacer	09726-35010	To replace lower arm bushing
Bushing replacer	09710-30020	To replace upper arm bushing

FRONT WHEEL ALIGNMENT (RN4×2)

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS
   (a) Check wheel runout and balance.
   (b) Check the front wheel bearings for looseness.
   (c) Check the front suspension for looseness.
   (d) Check the steering linkage for looseness.
   (e) Check that the front absorbers work properly by using the standard bounce test.
   (f) Check the tires for wear and proper inflation.

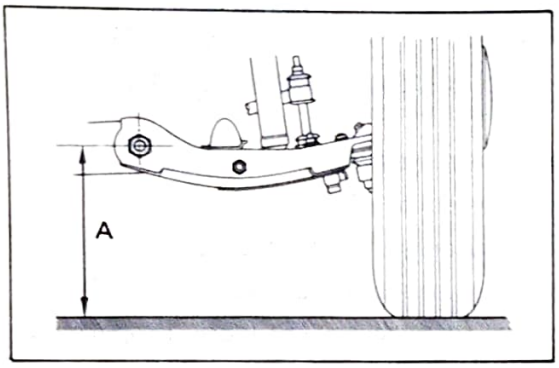
Cold tire inflation pressure

kg/cm² (psi)

Model	Tire size	Low speed driving		High speed driving	
		Front	Rear	Front	Rear
RN34L RN44L (STD)(DLX,OPT)	7.00–14–6PR	1.7 (24)	2.5 (36)	2.0 (28)*	2.5 (36)*
RN34L RN44L (DLX)	E78–14B	1.4 (20)	2.2 (32)	1.7 (24)*	2.2 (32)*
RN34L RN44L (SR5 & SR)	ER78–14B	1.4 (20)	2.2 (32)	1.7 (24)*	2.2 (32)*
RN34L RN44L (SR5 & SR, OPT)	205/70 SR14	1.4 (20)	2.2 (32)	1.7 (24)*	2.2 (32)*
RN44L–KH3 (3/4 ton)	7.50–14–6PR	1.7 (24)	2.5 (36)	2.0 (28)**	2.5 (36)**
RN44L–K3W (C&C)	7.50–14–6PR	1.7 (24)	2.5 (36)	2.0 (28)**	2.5 (36)**

*Do not drive over 120 km/h (75 mph) with 400 kg (882 lb) or more cargo.
**Do not drive over 120 km/h (75 mph) with 600 kg (1,323 lb) or more cargo.

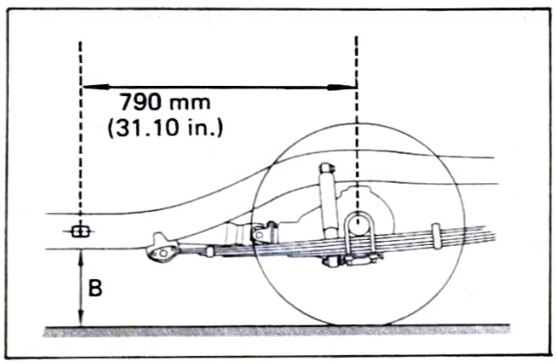
NOTE: For sustained high speeds above 120 km/h (75 mph), add 0.3 kg/cm² (4 psi), but never exceed the maximum cold tire pressure molded on the tire sidewall.



2. MEASURE VEHICLE HEIGHT

(a) Measure the vehicle front height.

If the vehicle is not at standard height, try to level the vehicle by shaking it down. If the height of the vehicle is still not correct, check for bad springs and worn or loose suspension parts, and adjust the vehicle front height with the torsion bar springs.



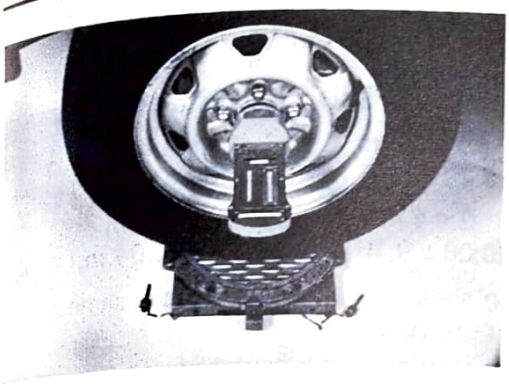
(b) Measure the vehicle rear height.

If the vehicle is not at standard height, try to level the vehicle by shaking it down. If the height of the vehicle is still not correct, check for bad springs and worn or loose suspension parts.

Vehicle height

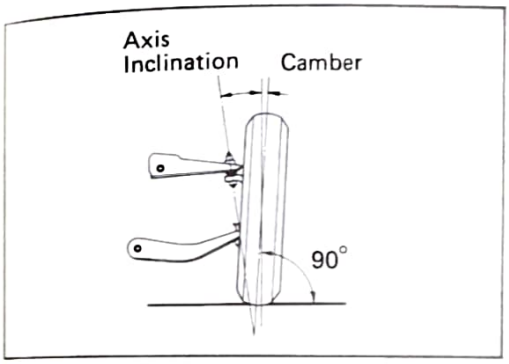
mm (in.)

Model	Pay load	Tire size	Unloaded		Loaded	
			Front (A)	Rear (B)	Front (A)	Rear (B)
RN34L RN44L (STD) (DLX, OPT)	1/2 ton	7.00–14–6PR	261.4 (10.291)	288.3 (11.350)	242.3 (9.539)	231.0 (9.094)
RN34L RN44L (DLX)	1/2 ton	E78–14B	254.4 (10.016)	281.3 (11.075)	235.3 (9.264)	224.0 (8.819)
RN34L RN44L (SR5 & SR)	1/2 ton	ER78–14B	250.6 (9.866)	271.0 (10.669)	231.3 (9.106)	205.0 (8.071)
RN34L RN44L (SR5 & SR, OPT)	1/2 ton	205/70 SR14	241.6 (9.512)	262.0 (10.315)	222.3 (8.752)	196.0 (7.717)
RN44L–KH3 (3/4 ton)	3/4 ton	7.50–14–6PR	278.4 (10.961)	305.3 (12.020)	259.3 (10.209)	248.0 (9.764)
RN44L–K3W (C&C)	1 ton	7.50–14–6PR	278.4 (10.981)	305.3 (12.020)	259.3 (10.209)	248.0 (9.764)



3. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manufacturer.

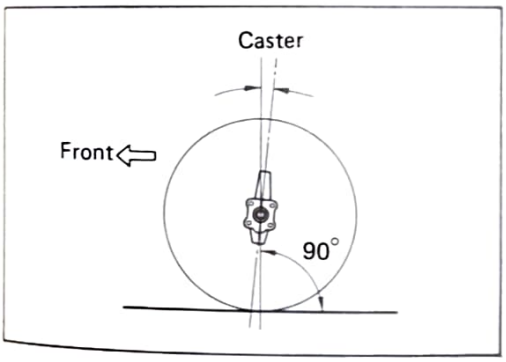


4. CHECK CAMBER, STEERING AXIS INCLINATION AND CASTER

Camber:

Inspection STD	1°05′ ± 45′
Adjustment STD	1°05′ ± 30′
Left right error	30′

Steering axis inclination: 7°10′



Caster:

RN 1/2 ton

Inspection STD	1° ± 45′
Adjustment STD	1° ± 30′
Left right error	30′

RN 3/4 ton and RN C&C

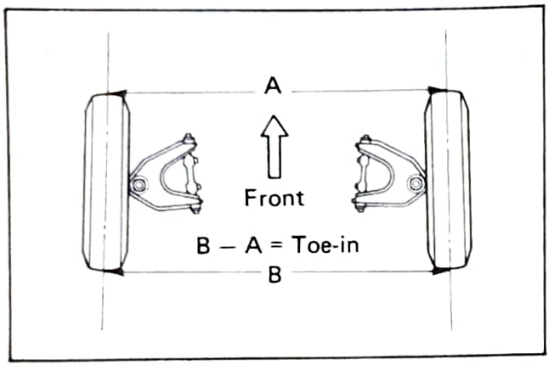
Inspection STD	30′ ± 45′
Adjustment STD	30′ ± 30′
Left right error	30′

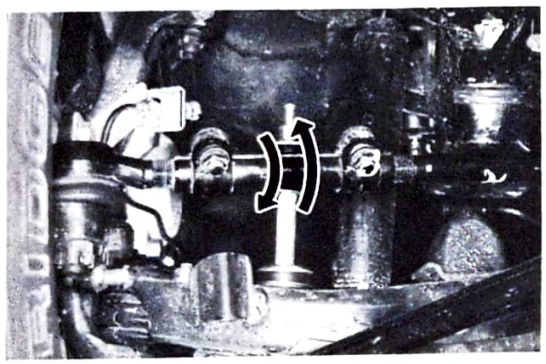
If camber or caster is out of specified value, adjust them by adding or removing shims on the upper arm.

Shim thickness

Part No.	Thickness mm (in.)
90565-12023	2.3 (0.091)
90565-12024	1.6 (0.063)
90565-12025	1.2 (0.047)

If steering axis inclination is not as specified after camber and caster have been correctly adjusted, recheck steering knuckle and front wheel for bending or looseness.





5. ADJUST TOE-IN

Toe-in:

	Inspection STD	Adjustment STD
Bias tire	5 ± 4 mm (0.20 ± 0.16 in.)	5 ± 1 mm (0.20 ± 0.04 in.)
Radial tire	2 ± 4 mm (0.08 ± 0.16 in.)	2 ± 1 mm (0.08 ± 0.04 in.)

NOTE: The toe-in should be measured at the same point on each tire and at the same level.

(a) Make sure the steering gear is centered.

(b) Loosen nuts holding the clamps on the left and right tie rods.

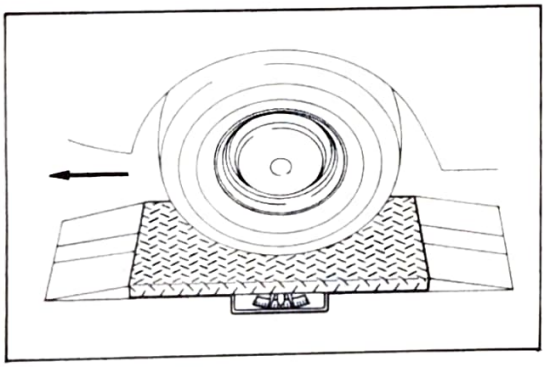
(c) Adjust toe-in to the correct value by turning left and right tie rod tubes an equal amount.

(d) Tighten nuts on the tie rod ends.

NOTE: Make sure that tie rods are the same length.

(e) Torque nuts holding the tube clamps.

Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)

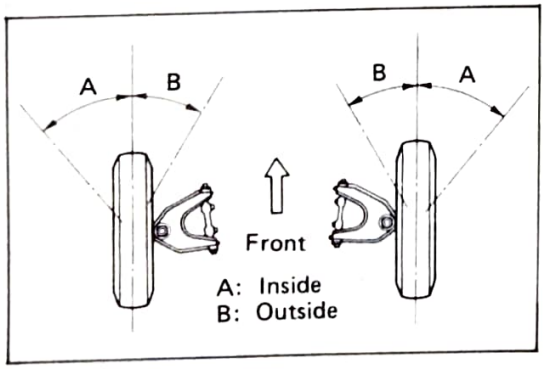


6. CHECK SIDE SLIP WITH SIDE SLIP TESTER

Side slip:

Less than 3.0 mm/m (0.118 in./3.3 ft)

If the side slip exceeds the limit, the toe-in or other front wheel alignment may not be correct.



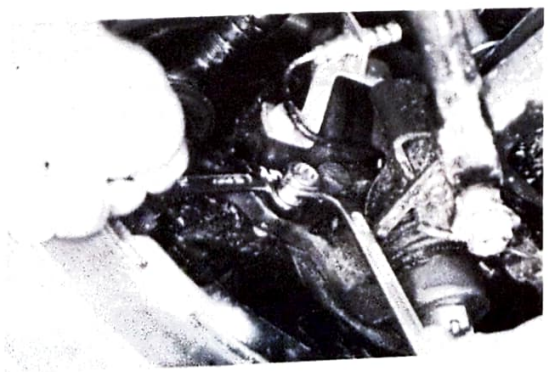
7. CHECK STEERING ANGLES

NOTE: When the steering wheel is turned fully, make sure that the wheel is not touching the body or brake flexible hose.

Wheel angle:

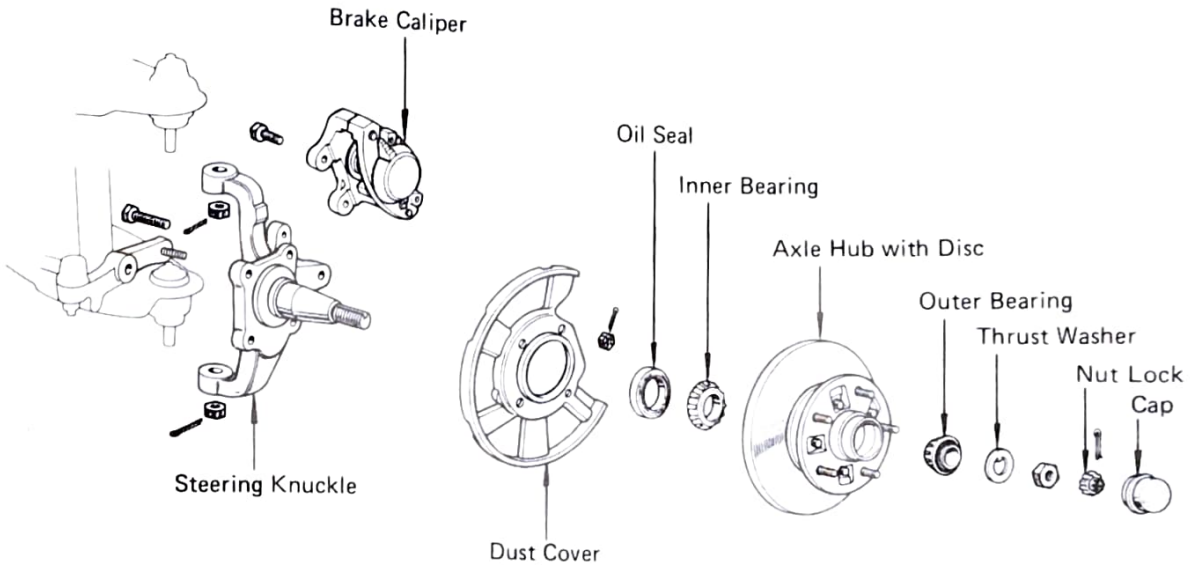
Inside $36^\circ {}^{+1^\circ}_{-2^\circ}$

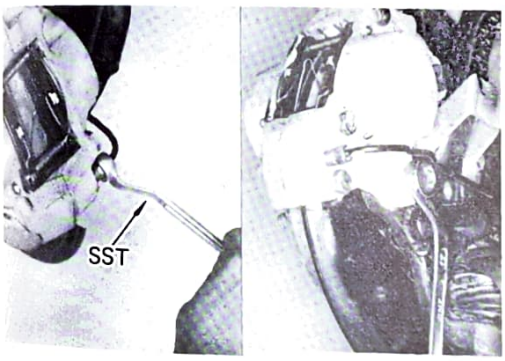
Outside 29°



If steering angles differ from standard value, adjust the steering angle with knuckle stopper bolts. If the steering angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.

FRONT AXLE HUB AND STEERING KNUCKLE (RN4×2)





Front Axle Hub

DISASSEMBLY OF FRONT AXLE HUB

1. REMOVE CALIPER

   (a) Using a flare nut wrench*, disconnect the brake tube from the caliper.

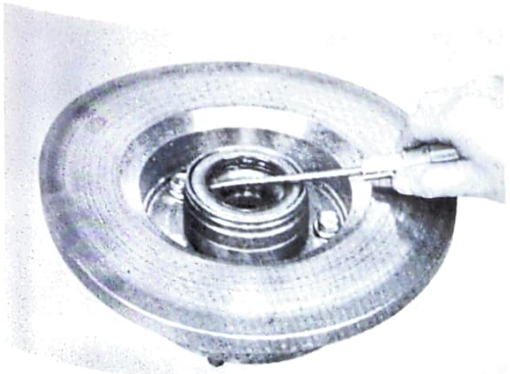
   *SST 09751-36011 or Commercial wrench

   (b) Remove the caliper from the knuckle.

2. REMOVE AXLE HUB WITH DISC

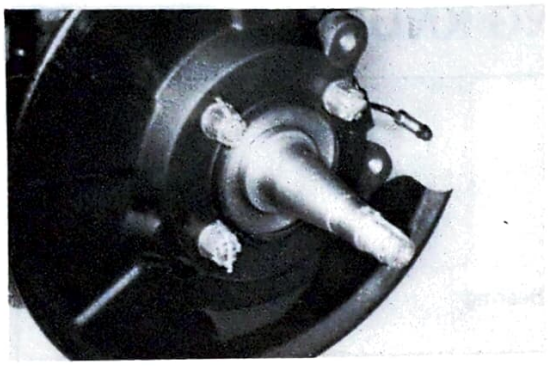
   Remove cap, cotter pin, nut lock, nut and axle hub.

3. REMOVE THRUST WASHER AND OUTER BEARING



4. REMOVE INNER BEARING AND OIL SEAL

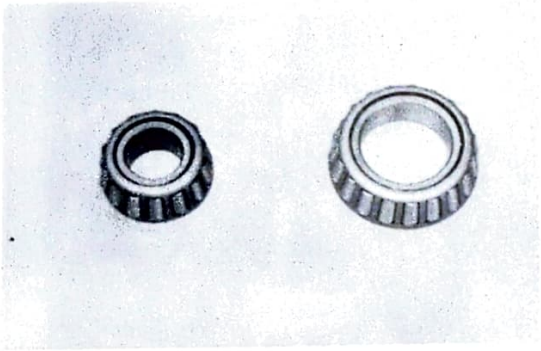
   Using a screwdriver, pry out the oil seal.



INSPECTION OF FRONT AXLE HUB

1. CLEAN AND INSPECT SPINDLE

Using a magnetic flaw detector or flaw detecting penetrant, check for damage or cracks.

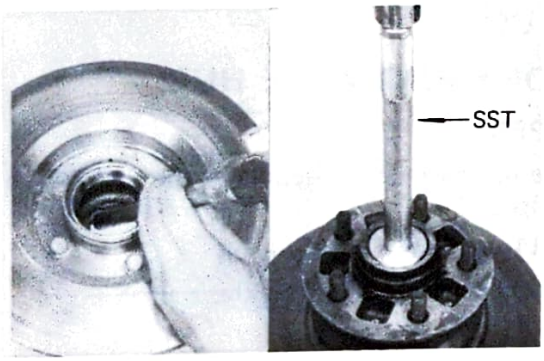


2. CLEAN AND INSPECT BEARINGS AND RACES

(a) Clean with solvent and dry with low-pressure compressed air.

(b) Inspect inner and outer bearings and races for wear or damage.

If a bearing or race requires replacement, it must be replaced as a set.



3. IF NECESSARY, REPLACE BEARING RACE

(a) Using a brass bar, drive out the bearing race.

(b) Using a bearing driver*, carefully drive in the new race.

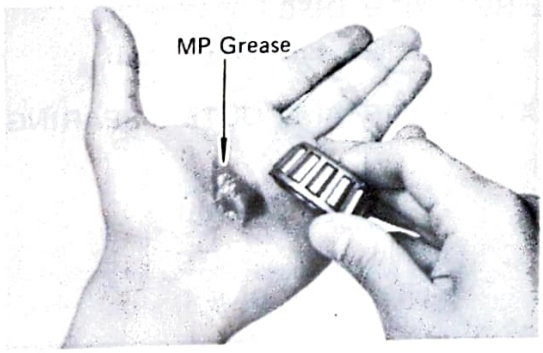
*SST 09608-30011 or Commercial driver

ASSEMBLY OF FRONT AXLE HUB
(See illustration on page 13-7)

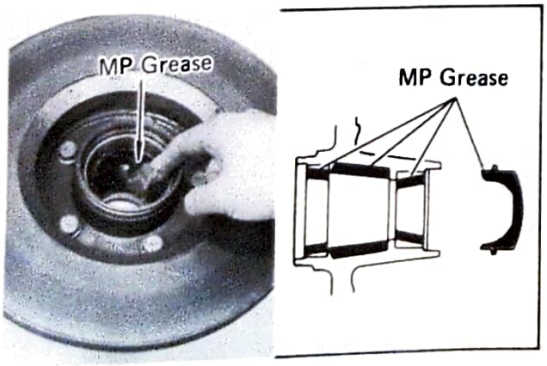
1. PACK BEARINGS WITH MULTIPURPOSE GREASE

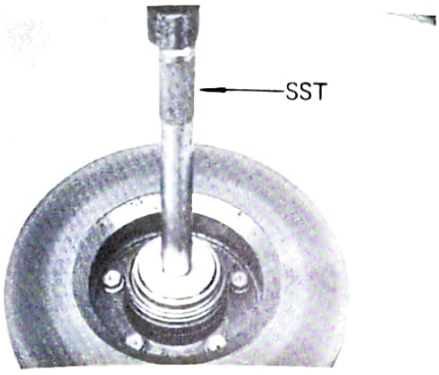
Place some grease in your hand and force grease into bearing until completely filled.

NOTE: If available, use a pressure bearing lubricator.



2. COAT INSIDE OF HUB AND CAP WITH MULTIPURPOSE GREASE





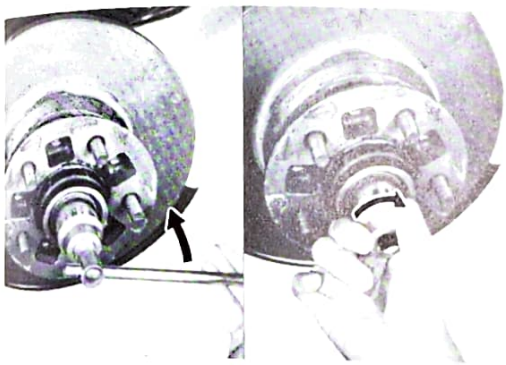
3. INSTALL INNER BEARING AND OIL SEAL

Place inner bearing into the hub. Using a seal driver, drive the oil seal into the hub. Coat the oil seal with multi-purpose grease.

4. INSTALL AXLE HUB ON SPINDLE

(a) Place the axle hub on the spindle.

(b) Install the outer bearing and thrust washer.



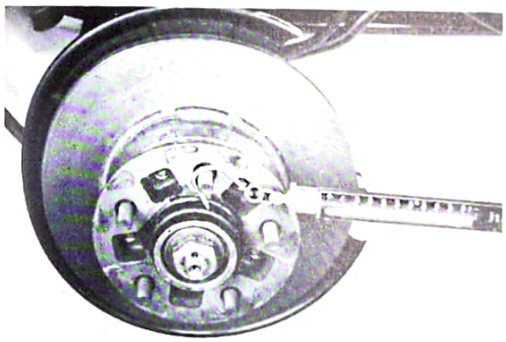
5. ADJUST PRELOAD

(a) Install and torque the nut.

Torque: 3.0 kg-m (22 ft-lb)

(b) Turn the hub right and left two or three times.

(c) Loosen the nut until it can be turned by hand. Using a socket, tighten the nut as tight as possible by hand.



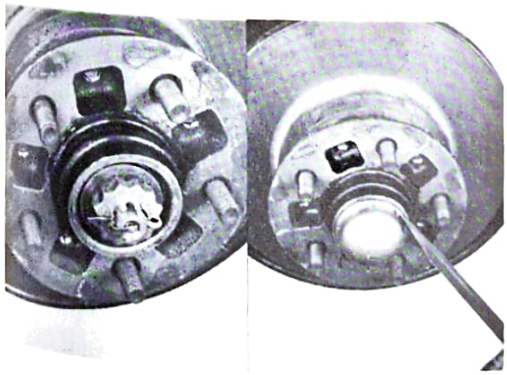
(d) Using a spring tension gauge, check the preload.

Preload (at starting): 0.6 – 1.8 kg (1.3 – 4.0 lb)

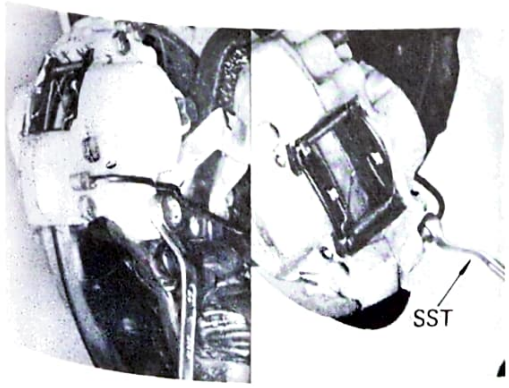
If preload is less than specification, tighten the nut slightly and check again.

If preload is excessive, loosen the nut and using a socket, retighten it as tight as possible by hand.

Check the preload again.



6. INSTALL NUT LOCK, COTTER PIN AND CAP



7. INSTALL BRAKE CALIPER

(a) Install brake caliper to the knuckle. Torque the mounting bolts.

Torque:

RN 1/2 ton and 3/4 ton
9.3 – 12.0 kg-m (68 – 86 ft-lb)
RN C&C 11.0 – 17.5 kg-m (80 – 126 ft-lb)

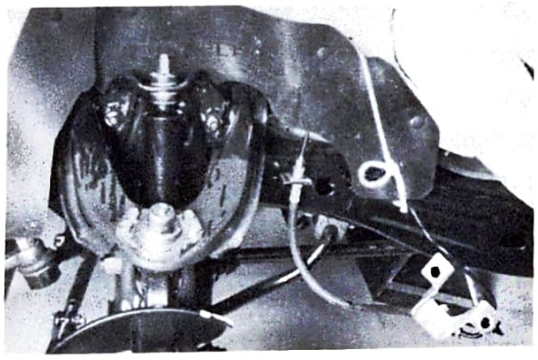
(b) Using a flare nut wrench*, connect the brake tube to the brake capliper.

*SST 09751-36011 or Commerical wrench

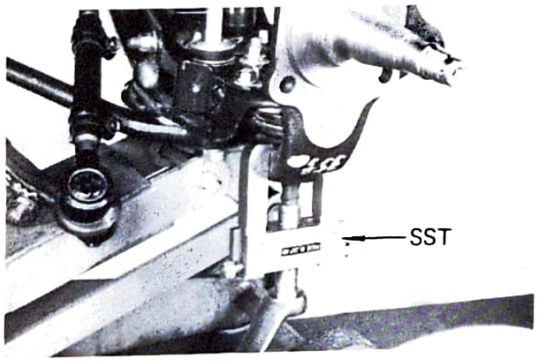
Steering Knuckle

REMOVAL OF STEERING KNUCKLE (See illustration on page 13-7)

1. REMOVE FRONT AXLE HUB AND BRAKE CALIPER (See page 13-7)

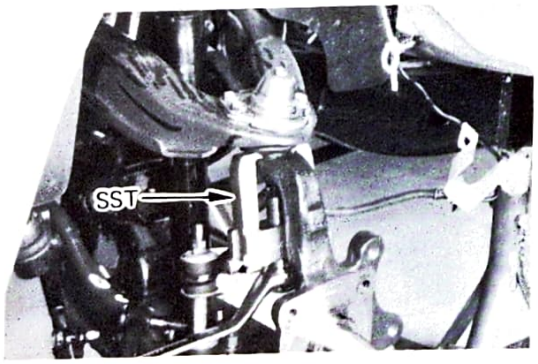


2. REMOVE KNUCKLE ARM AND DUST COVER
3. SUSPEND BRAKE HOSE FROM APPROPRIATE PLACE



4. DISCONNECT LOWER BALL JOINT FROM STEERING KNUCKLE
   (a) Support the lower arm with a jack.
   (b) Using a ball joint puller*, disconnect the lower ball joint from the steering knuckle.

   *SST 09628-62010 or Commercial puller



5. DISCONNECT UPPER BALL JOINT FROM STEERING KNUCKLE

   Using a ball joint puller*, disconnect the upper ball joint from the steering knuckle.

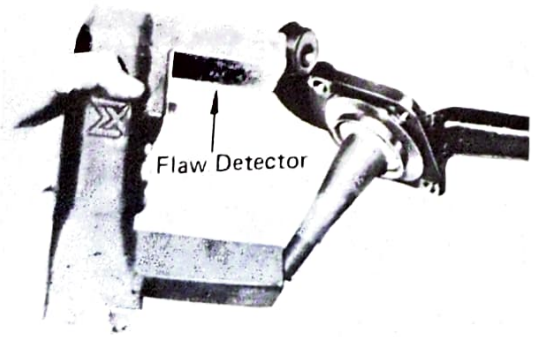
   *SST 09628-62010 or Commercial puller

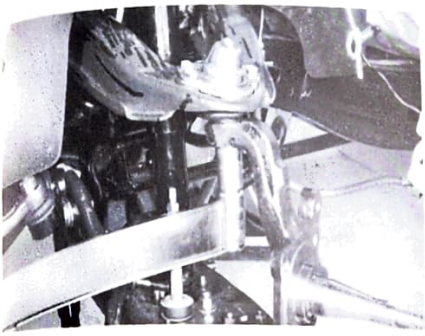
INSPECTION OF STEERING KNUCKLE

INSPECT STEERING KNUCKLE

Inspect the knuckle for damage or cracks.

NOTE: It is recommended that a flaw detector or liquid penetrate be used for this inspection.
If the steering knuckle is damaged or cracked, replace it.





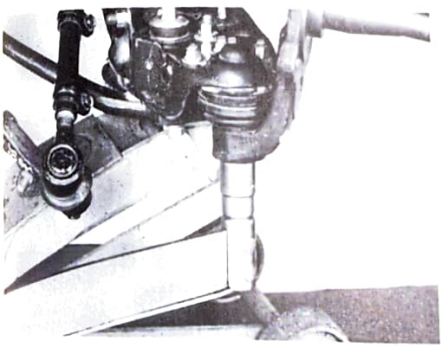
INSTALLATION OF STEERING KNUCKLE

1. CONNECT UPPER BALL JOINT TO STEERING KNUCKLE

   (a) Insert the steering knuckle on the upper ball joint and tighten the nut.

   Torque: 9.0 – 13.0 kg-m (66 – 94 ft-lb)

   (b) Secure the nut with a cotter pin.

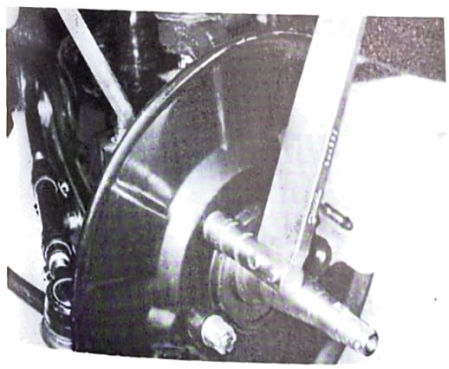


2. CONNECT LOWER BALL JOINT TO STEERING KNUCKLE

   (a) Insert the lower ball joint in the steering knuckle and tighten the nut.

   Torque: 12.0 – 17.0 kg-m (87 – 122 ft-lb)

   (b) Secure the nut with a cotter pin.



3. INSTALL KNUCKLE ARM AND DUST COVER

   (a) Insert the knuckle arm bolt in the steering knuckle.

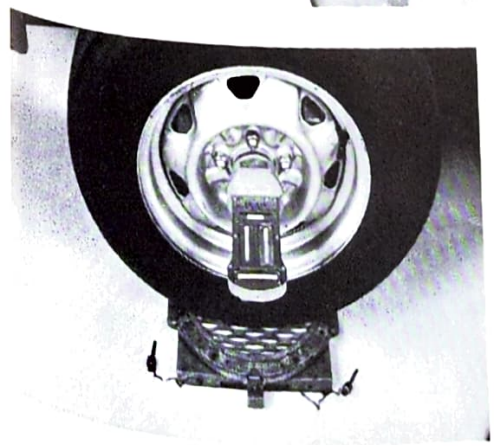
   (b) Place the dust cover and brake hose bracket in position.

   (c) Insert the bolts and tighten the nuks.

   Torque: 9.0 – 13.0 kg-m (66 – 94 ft-lb)

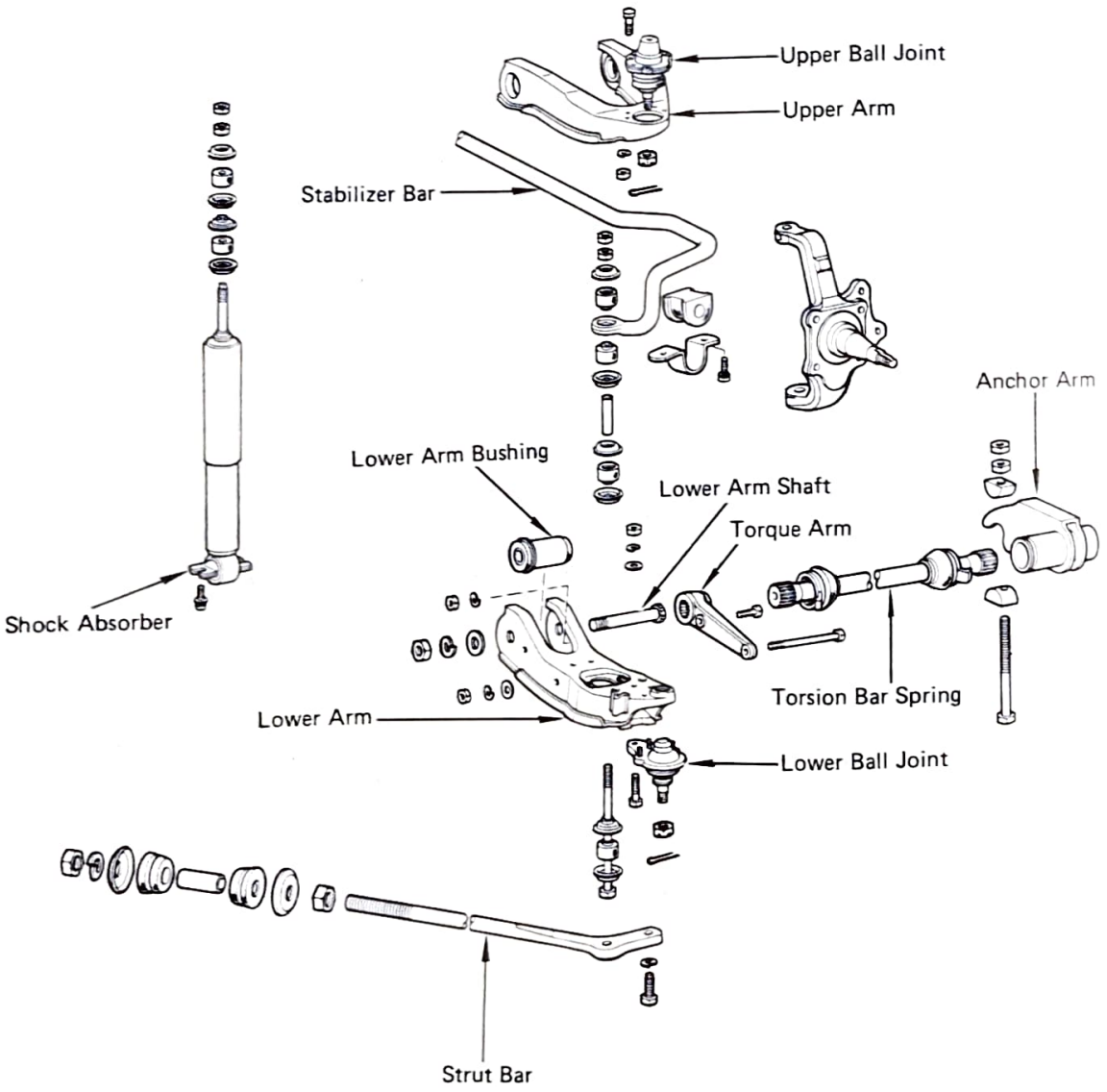
   (d) Secure the nuts with cotter pins.

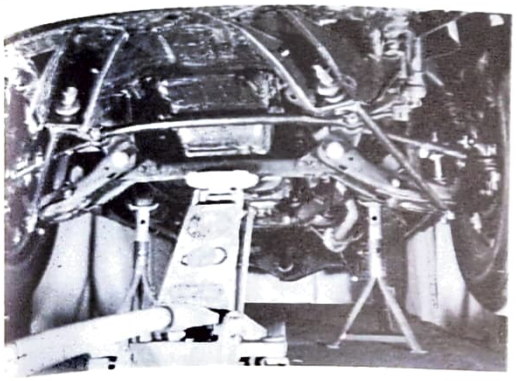
4. INSTALL FRONT AXLE HUB AND BRAKE CALIPER **(See page 13-8)**



5. CHECK FRONT WHEEL ALIGNMENT **(See page 13-3)**

FRONT SUSPENSION (RN4×2)

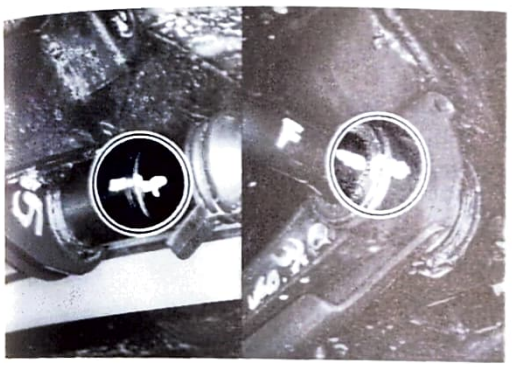




Torsion Bar Spring

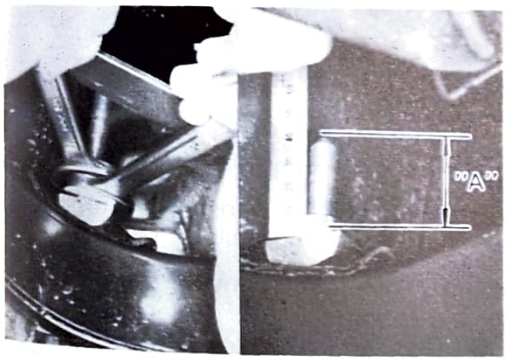
REMOVAL OF TORSION BAR SPRING

1. JACK UP AND SUPPORT FRAME ON STANDS



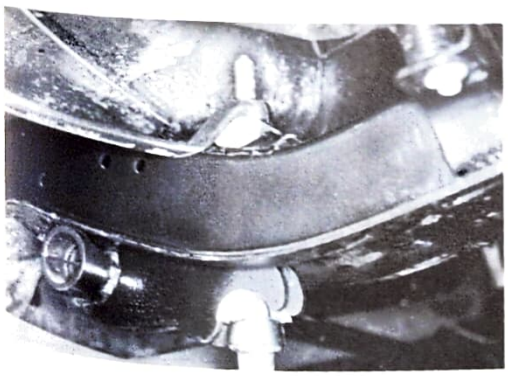
2. PLACE ALIGNMENT MARKS ON TORSION BAR SPRING, ANCHOR ARM AND TORQUE ARM

   Remove the boots and place alignment marks on the torsion bar spring, anchor arm and torque arm.



3. REMOVE LOCK NUT AND MEASURE PROTRUDING BOLT END "A", AS SHOWN

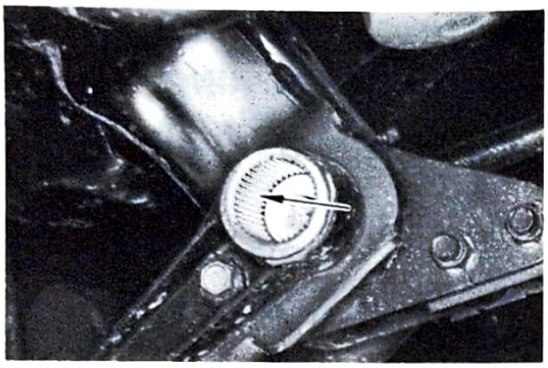
   NOTE: Use this measurement for reference when adjusting the vehicle height.



4. LOOSEN ADJUSTING NUT AND REMOVE ANCHOR ARM AND TORSION BAR SPRING

INSPECTION OF TORSION BAR SPRING

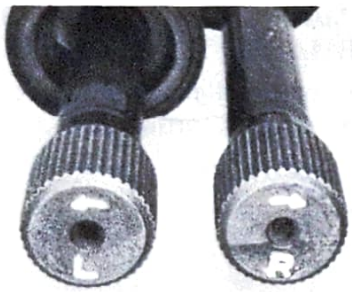
1. INSPECT PARTS FOR WEAR OR DAMAGE



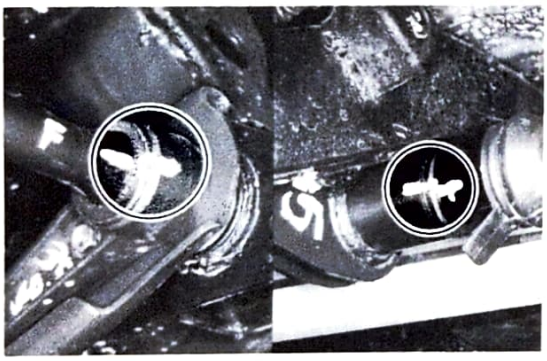
2. INSPECT SPLINE OF TORQUE ARM FOR DAMAGE

INSTALLATION OF TORSION BAR SPRING (See illustration on page 13-12)

NOTE: There are left and right identification marks on the rear end of the torsion bar springs.
Be careful not to interchange them.



Left Right



1. INSTALL TORSION BAR SPRING AND ANCHOR ARM

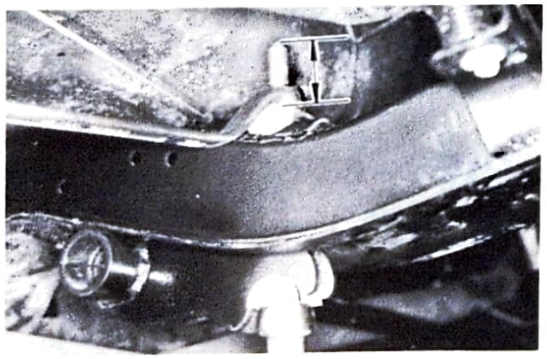
When Reusing Torsion Bar Spring

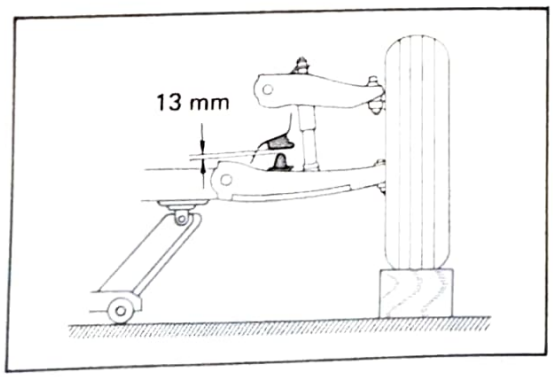
(a) Apply a light coat of multipurpose grease to the spline of the torsion bar spring.

(b) Align the alignment marks and install the torsion bar spring to the torque arm.

(c) Align the alignment marks and install the anchor arm to the torsion bar spring.

(d) Tighten the adjusting nut so that the bolt protrusion is equal to that before removal.

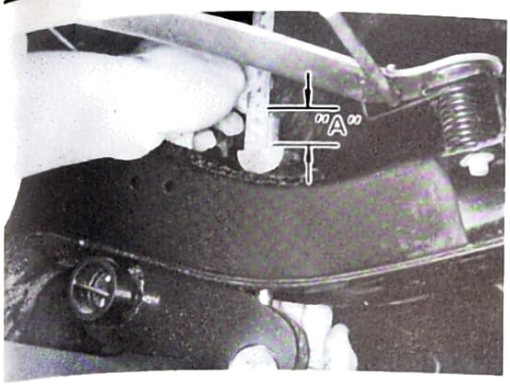




When Using a New Torsion Bar Spring

(a) Jack up the front of the vehicle and place a wooden block with a height of 180 – 200 mm (7.09 – 7.87 in.) under the front tire.
Lower the jack until the clearance between the spring bumper on the lower arm and frame is 13 mm (0.51 in.).

NOTE: Place stands under the vehicle for safety.



(b) Apply a light coat of multipurpose grease to the spline of the torsion bar spring.

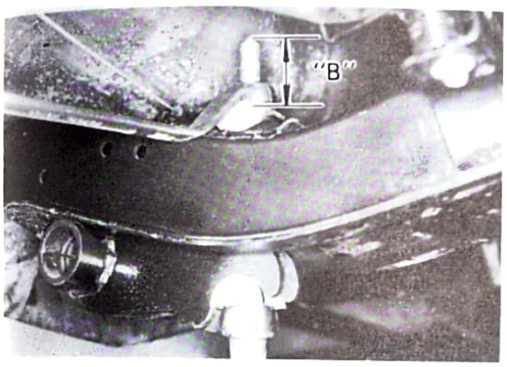
(c) Insert the anchor arm onto the torsion bar spring so that bolt protrusion "A" is the extent shown below.

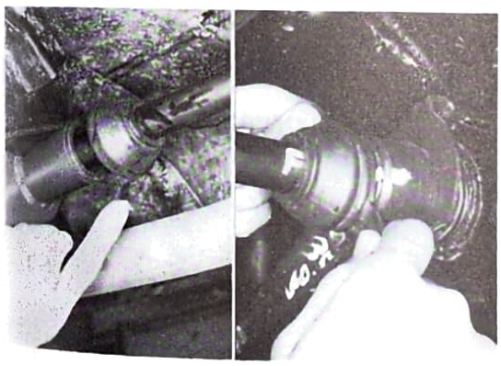
Bolt protrusion "A":
RN 1/2 ton 8 – 28 mm (0.31 – 1.10 in.)
RN 3/4 ton and RN C&C
11 – 31 mm (0.43 – 1.22 in.)

(d) Remove the wooden block and lower the front of the vehicle until it rests on the stands.

(e) Tighten the adjusting nut so that bolt protrusion "B" is the extent shown below.

Bolt protrusion "B": 69 – 89 mm (2.72 – 3.50 in.)

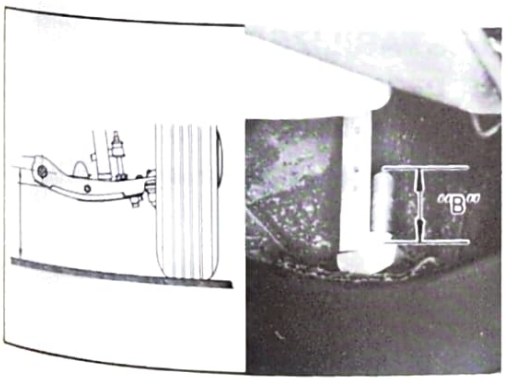




2. INSTALL BOOTS

(a) Apply multipurpose grease to the boot lips.

(b) Assemble the boots to the torque arm and the anchor arm.

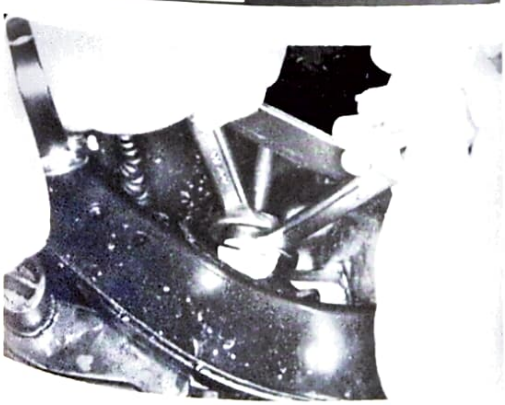


3. ADJUST VEHICLE HEIGHT (See page 13-4)

(a) Remove the stands and bounce the vehicle several times to settle the suspension.

(b) Adjust the vehicle height to the standard value with the adjusting nut.

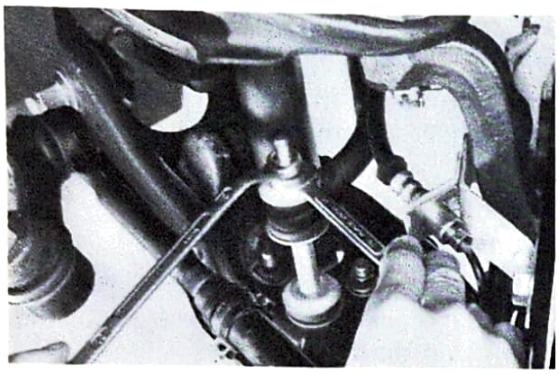
NOTE: If bolt protrusion "B" is not within 69 – 89 mm (2.72 – 3.50 in.), change the position of the anchor arm spline and reassemble.

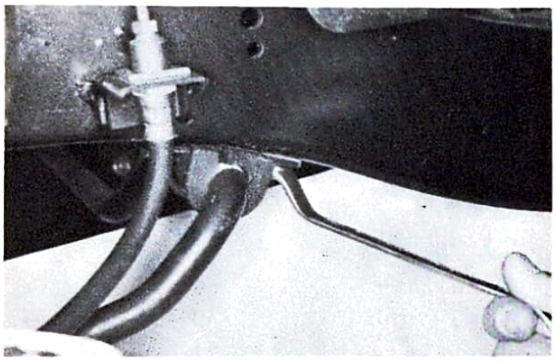


4. TIGHTEN LOCK NUT

Using two wrenches, tighten the lock nut.
Torque the lock nut.

Torque: 7.0 – 9.0 kg-m (51 – 65 ft-lb)



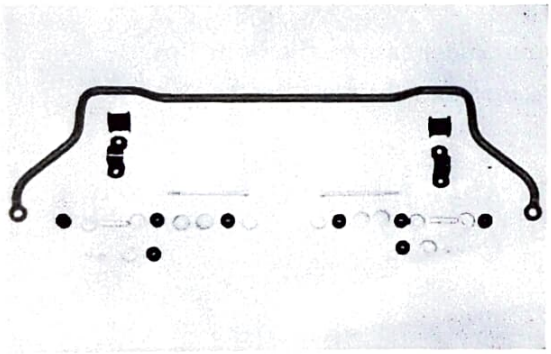


Stabilizer Bar

REMOVAL OF STABILIZER BAR
(See illustration on page 13-12)

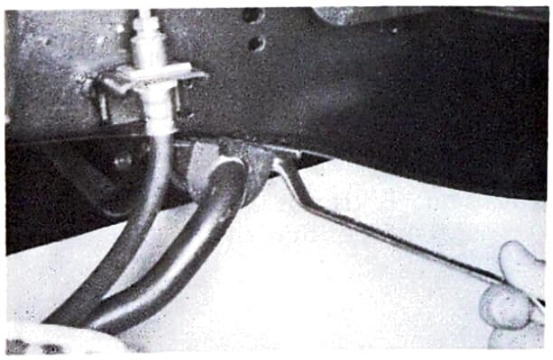
1. REMOVE ONE TORSION BAR SPRING
(See page 13-13)

2. REMOVE STABILIZER BAR FROM LOWER ARMS
   (a) Remove the nuts, cushions and bolts holding both sides of stabilizer bar to lower arms, and disconnect the stabilizer bar.
   (b) Remove both stabilizer bar bushings and brackets from the frame, and remove the stabilizer bar.



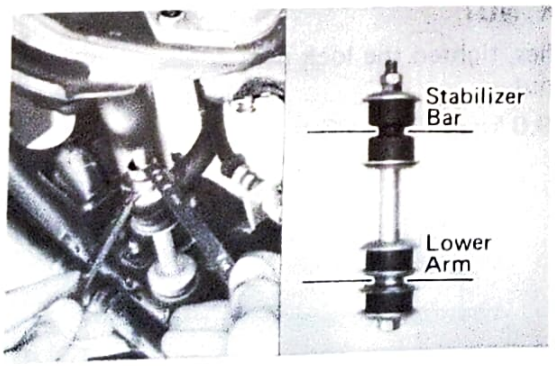
INSPECTION OF STABILIZER BAR

INSPECT STABILIZER BAR
Inspect the stabilizer bar component parts for wear or damage.



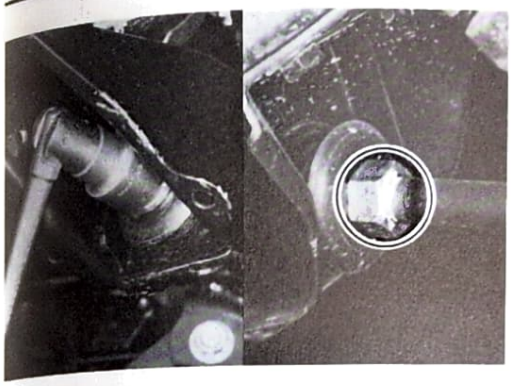
INSTALLATION OF STABILIZER BAR
(See illustration on page 13-12)

1. INSTALL STABILIZER BAR TO FRAME
   Place the stabilizer bar in position and install both stabilizer bushings and brackets to the frame.
   Torque the bolts.
   Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



2. CONNECT STABILIZER BAR TO LOWER ARMS
   Connect the stabilizer bar on both sides to the lower arms with bolts, cushions and nuts as shown. Torque the nuts.
   Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

3. INSTALL TORSION BAR SPRING
(See page 13-14)

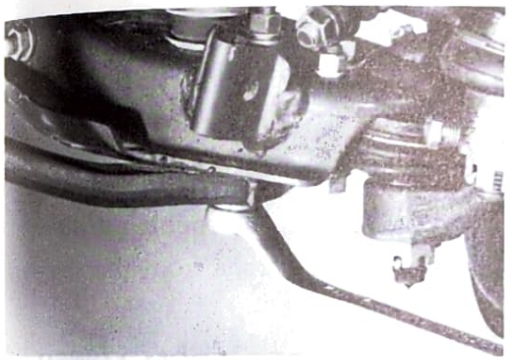


Strut Bar

REMOVAL OF STRUT BAR
(See illustration on page 13-12)

1. PLACE MATCHMARKS ON STRUT BAR THREADED PORTION

2. REMOVE NUT FROM STRUT BAR



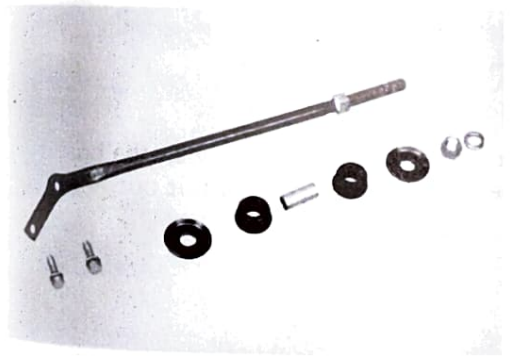
3. REMOVE STRUT BAR FROM LOWER ARM

Remove the bolt holding the strut bar to the lower arm, and remove the strut bar.

INSPECTION OF STRUT BAR

INSPECT STRUT BAR

Inspect the strut bar component parts for wear or damage.

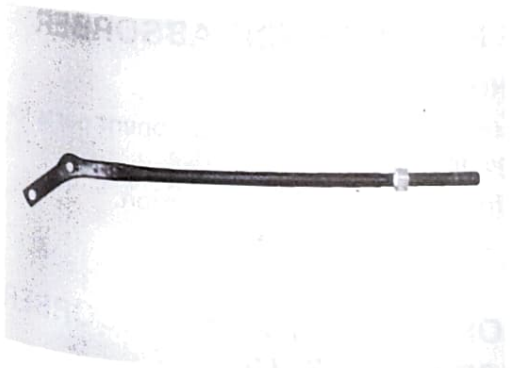


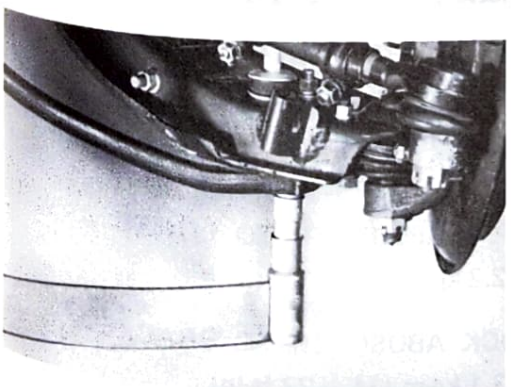
INSTALLATION OF STRUT BAR
(See illustration on page 13-12)

1. ASSEMBLE REAR NUT, WASHER AND CUSHION

(a) Assemble the rear nut to the strut bar according to the matchmarks placed with removing.

(b) Assemble the rear washer and cushion to the strut bar.



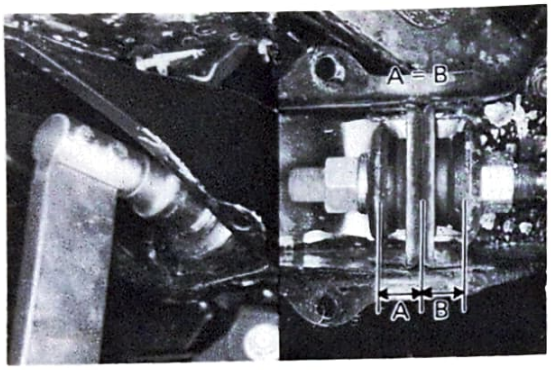


2. INSERT STRUT BAR IN BRACKET

3. CONNECT STRUT BAR TO LOWER ARM

Tighten the bolts.

Torque: 7.5 – 10.5 kg-m (55 – 75 ft-lb)

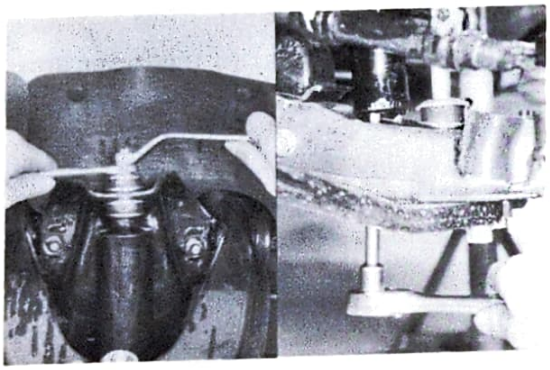


4. CONNECT STRUT BAR TO BRACKET

Install the collar, cushion and washer to the strut bar, and tighten the nut.

Torque: 9.5 – 15.0 kg-m (69 – 108 ft-lb)

NOTE: When replacing the strut bar, do so with the vehicle unloaded and vehicle weight on the tires. Tighten the front and rear nuts a little at a time and equally. Assemble so that A and B in the figure are equal.



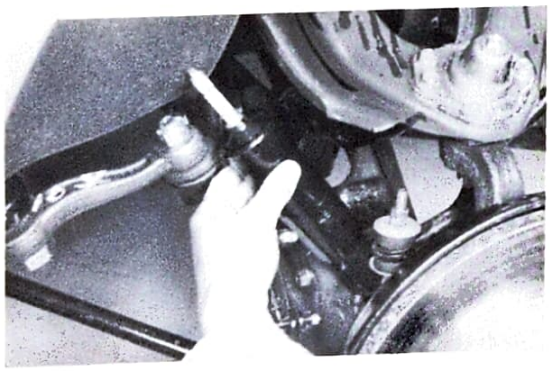
Front Shock Absorber

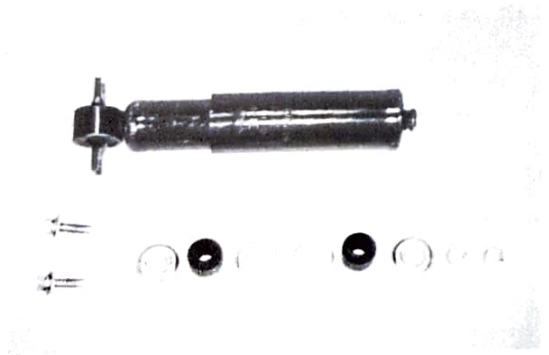
REMOVAL OF FRONT SHOCK ABSORBER (See illustration on page 13-12)

1. DISCONNECT SHOCK ABSORBER FROM BRACKET
   (a) Remove the two nuts holding absorber to the bracket.
   (b) Remove the washers and cushions from the shaft of the shock absorber.

2. DISCONNECT SHOCK ABSORBER FROM LOWER ARM

3. REMOVE SHOCK ABSORBER
   (a) Fully compress the shock absorber.
   (b) Tilt the absorber foward, turn it 90° so the bushing is at right angles to the vehicle and pull it out.

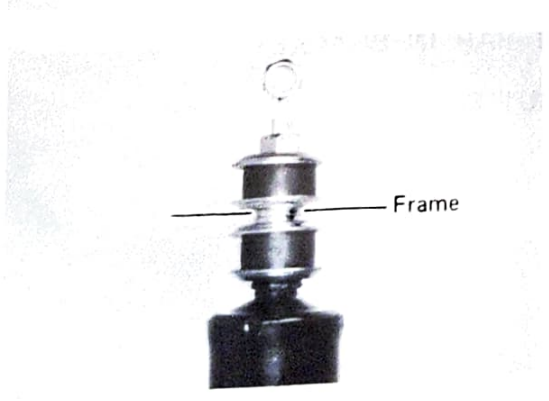




INSPECTION OF FRONT SHOCK ABSORBER

INSPECT FRONT SHOCK ABSORBER

(a) Inspect the front shock absorber component parts for wear, damage or oil leaks.
(b) Inspect the front shock absorber operation.



INSTALLATION OF FRONT SHOCK ABSORBER (See illustration on page 13-12)

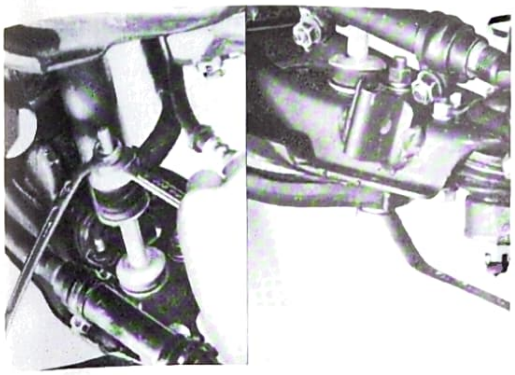
1. INSERT SHOCK ABSORBER IN LOWER ARM
   (a) Fully compress the shock absorber.
   (b) Tilt the absorber forward and insert so the bushing is at right angle to the vehicle.

2. CONNECT SHOCK ABSORBER TO LOWER ARM

   Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

3. CONNECT SHOCK ABOSRBER TO BRACKET

   Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)



Lower Suspension Arm

REMOVAL OF LOWER SUSPENSION ARM (See illustration on page 13-12)

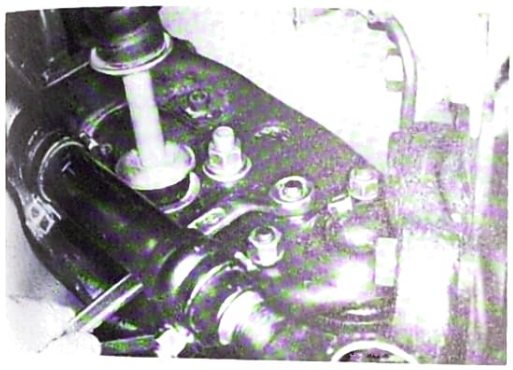
1. REMOVE TORSION BAR SPRING
(See page 13-13)

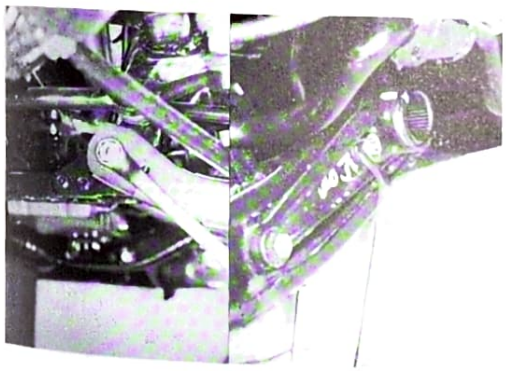
2. DISCONNECT STABILIZER BAR FROM LOWER ARM

3. DISCONNECT STRUT BAR FROM LOWER ARM

4. REMOVE FRONT SHOCK ABSORBER
(See page 13-18)

5. DISCONNECT LOWER BALL JOINT FROM LOWER ARM

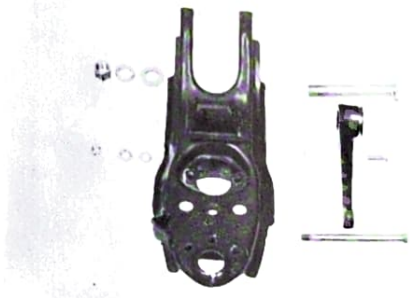


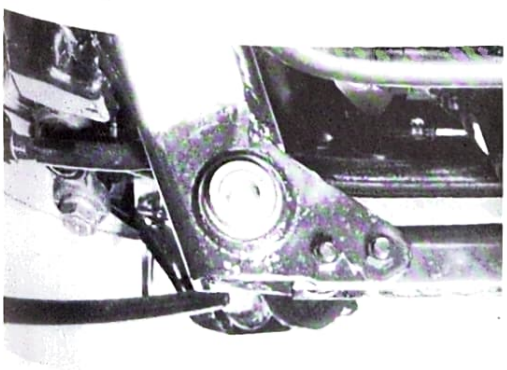


6. REMOVE LOWER ARM
   (a) Remove the lower arm shaft nut.
   (b) Remove the torque arm and lower arm shaft from the lower arm, and pull down the lower arm.

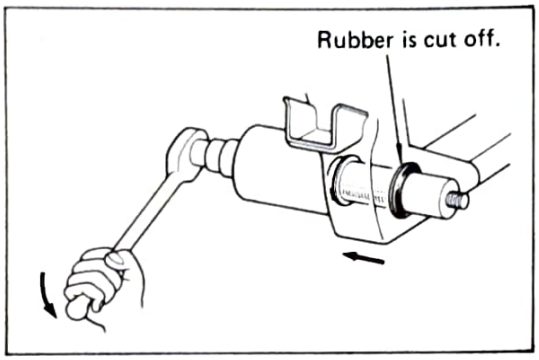
INSPECTION OF LOWER ARM

1. INSPECT LOWER ARM
   Inspect the lower arm component parts for wear or damage.





2. INSPECT LOWER ARM BUSHING
   Inspect the lower arm bushing for wear or damage.
   If the bushing is worn or damaged, replace it.

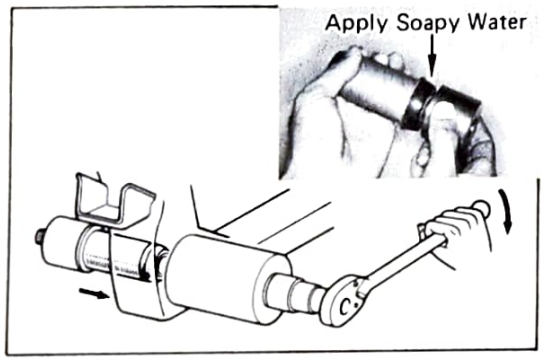


3. IF NECESSARY, REPLACE LOWER ARM BUSHING

(a) Using SST*, remove the bushing from the cross member.

*SST 09726-35010

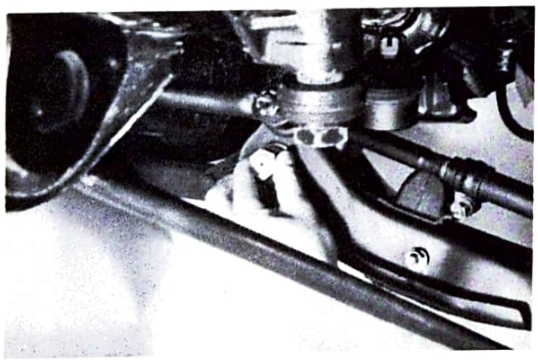
NOTE: As the bushing is removed, the rubber on the rear side will be cut off.



(b) Apply soapy water on the front rubber part of the bushing and fit SST on the new bushing.

(c) Using SST, install the new bushing to the cross-member.

INSTALLATION OF LOWER ARM (See illustration on page 13-12)

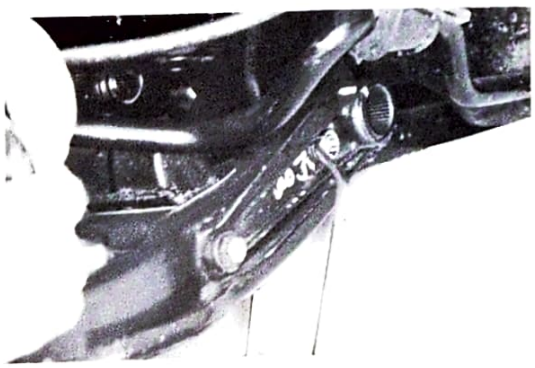


1. INSTALL LOWER ARM

(a) Place the lower arm in position and insert the shaft in the lower arm.

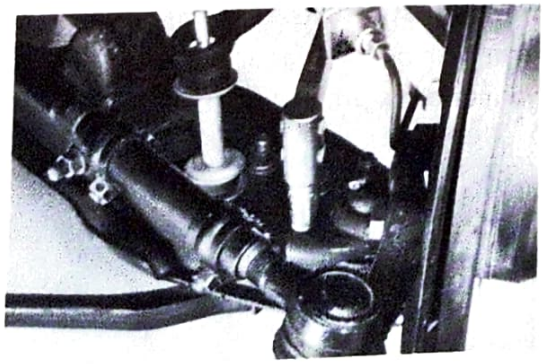
(b) Finger tighten the mounting nut.

NOTE: Do not torque the nut.



(c) Install the torque arm to the lower arm. Tighten the bolts and nuts.

Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)

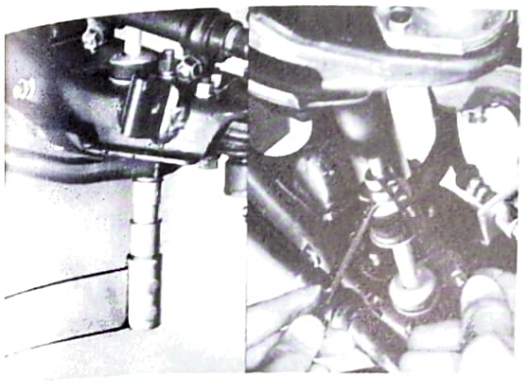


2. CONNECT LOWER BALL JOINT TO LOWER ARM

Tighten the bolts and nuts.

Torque:

8 mm bolt	2.0 – 3.0 kg-m (15 – 21 ft-lb)
10 mm bolt	4.0 – 5.5 kg-m (29 – 39 ft-lb)

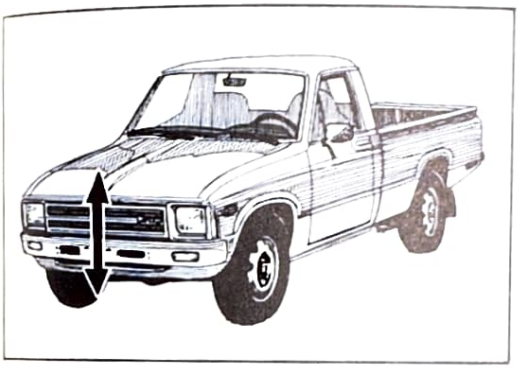


3. INSTALL FRONT SHOCK ABSORBER
(See page 13-18)

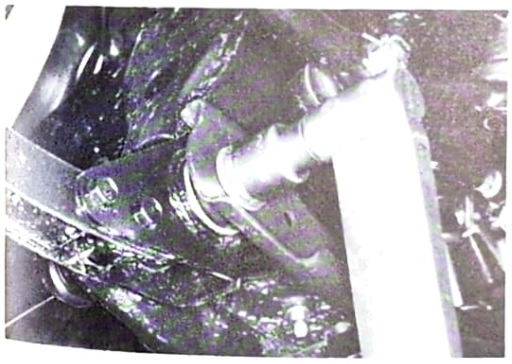
4. CONNECT STRUT BAR TO LOWER ARM
Torque: 7.5 – 10.5 kg-m (55 – 75 ft-lb)

5. CONNECT STABILIZER BAR TO LOWER ARM
Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

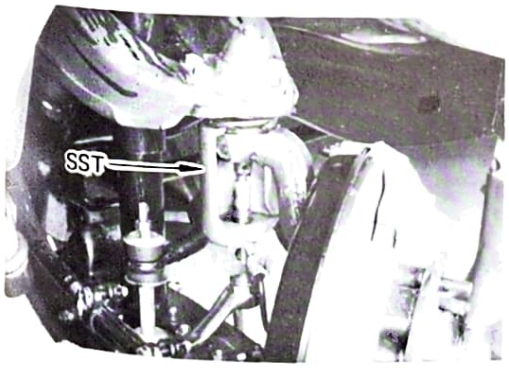
6. INSTALL TORSION BAR SPRING
(See page 13-14)



7. REMOVE STANDS AND BOUNCE VEHICLE TO STABILIZE LOWER ARM BUSHING



8. TIGHTEN LOWER ARM SHAFT NUT
Torque the nut.
Torque: 20.0 – 30.0 kg-m (145 – 216 ft-lb)



Upper Suspension Arm

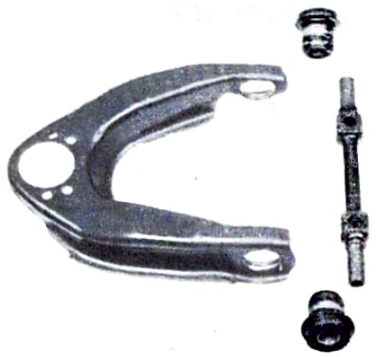
REMOVAL OF UPPER ARM
(See illustration on page 13-12)

1. DISCONNECT UPPER BALL JOINT FROM STEERING KNUCKLE (See page 13-25)

2. REMOVE UPPER ARM
Remove the upper arm mounting bolts and camber adjusting shims.

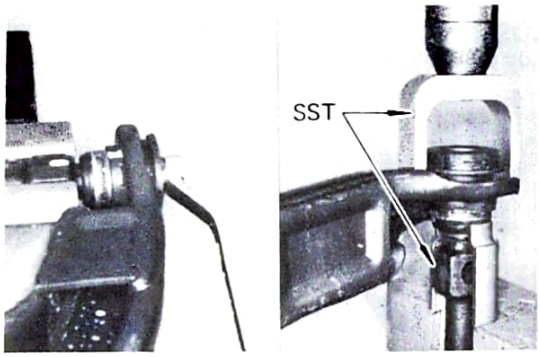
NOTE: Do not lose the camber adjusting shims.
Record the position, and the thickness of camber adjusting shims so that these can be reinstalled to their original location.

INSPECTION OF UPPER ARM



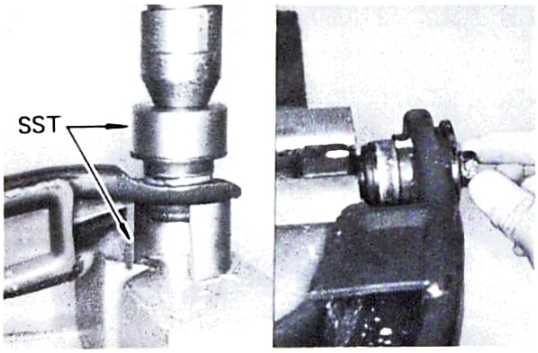
1. INSPECT UPPER ARM
   (a) Inspect the upper arm for damage.
   (b) Inspect the bushings for wear or damage.

   If the bushings are worn or damaged, replace them.



2. IF NECESSARY, REPLACE UPPER ARM BUSHINGS
   (a) Remove the bolts and washers from the upper arm.
   (b) Using SST*, press out the bushings from the upper arm.

   *SST 09710-30020



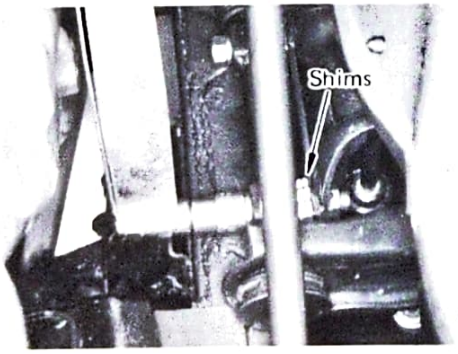
   (c) Using SST*, press the new bushings into the upper arm.

   *SST 09710-30020

   (d) Install the washers to the upper arm. Finger tighten the bolts.

   NOTE: Do not torque the bolts.

INSTALLATION OF UPPER ARM
(See illustration on page 13-12)



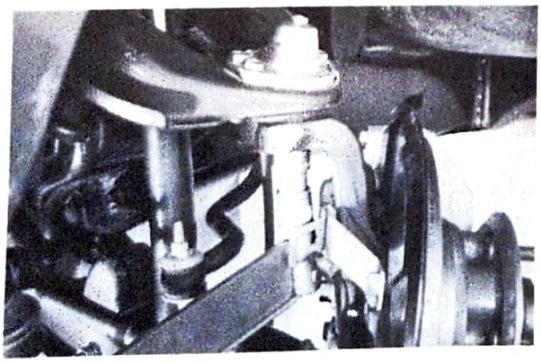
1. INSTALL UPPER ARM

   Install the upper arm together with the camber adjusting shims.

   Torque the bolts.

   Torque: 7.0 – 9.0 kg-m (51 – 65 ft-lb)

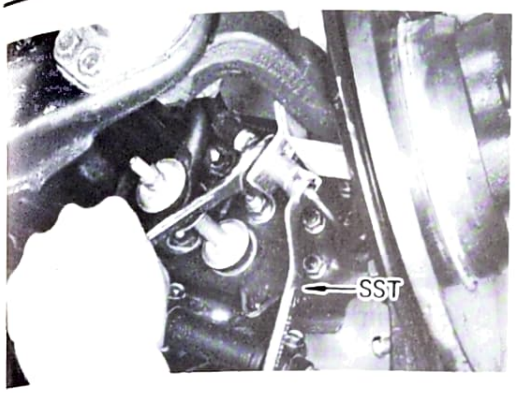
   NOTE: Install an equal number and thickness of shims in their original position.



2. CONNECT UPPER BALL JOINT TO STEERING KNUCKLE

   Tighten the castle nut and secure it with a cotter pin.

   Torque: 9.0 – 13.0 kg-m (66 – 94 ft-lb)



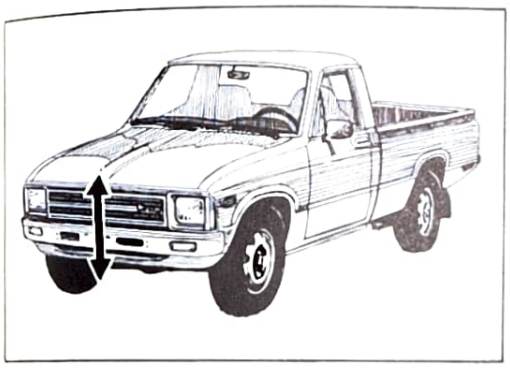
3. CONNECT BRAKE HOSE AND TUBE

Using a flare nut wrench*, connect the hose and tube. Torque the connection.

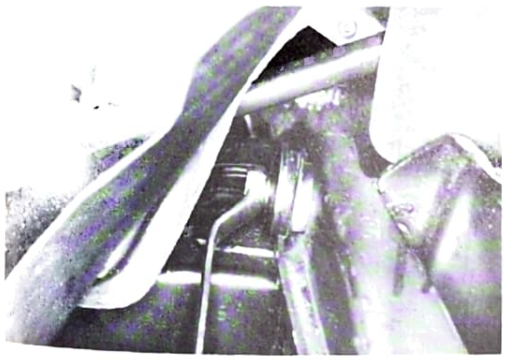
Torque: 1.3 – 1.8 kg-m (10 – 13 ft-lb)

*SST 09751-36011 or Commercial wrench

4. BLEED BRAKE SYSTEM



5. REMOVE STANDS AND BOUNCE VEHICLE TO STABILIZE UPPER ARM BUSHINGS



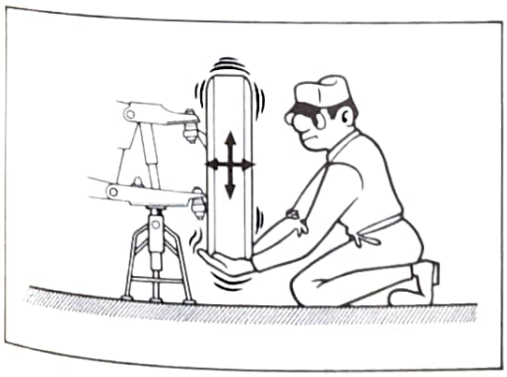
6. TIGHTEN UPPER ARM SHAFT BOLTS

Torque the bolts.

Torque: 8.5 – 11.0 kg-m (62 – 79 ft-lb)

Ball Joints

INSPECTION OF BALL JOINTS



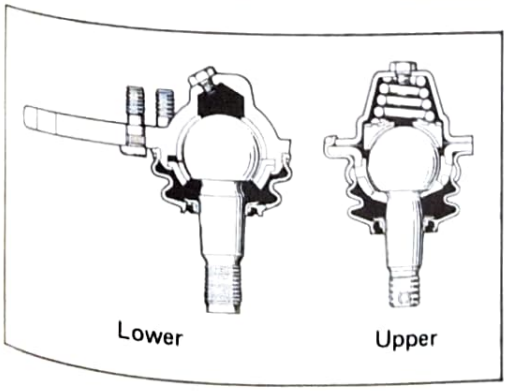
1. INSPECT BALL JOINTS FOR EXCESSIVE LOOSENESS

(a) Jack up the lower arm until the tire is off the ground.

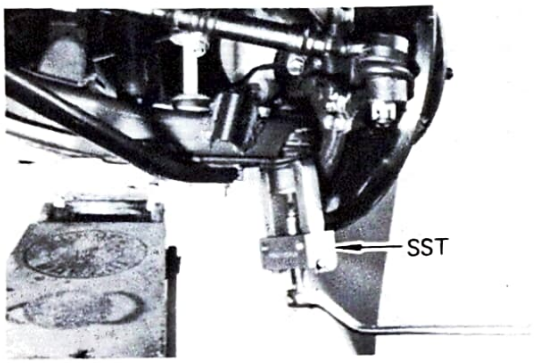
(b) Move the tire up and down and check that there is no excessive play.

Maximum ball joint vertical play: 2.3 mm (0.091 in.)

NOTE: Perform this inspection with the brake pedal depressed to prevent occurrence of wheel bearing play.



2. INSPECT DUST COVER FOR DAMAGE



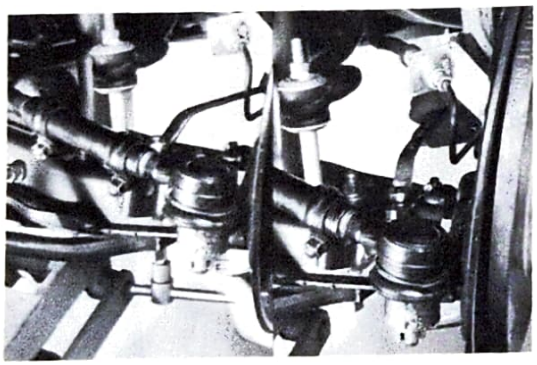
REMOVAL OF LOWER BALL JOINT
(See illustration on page 13-12)

1. DISCONNECT LOWER BALL JOINT FROM STEERING KNUCKLE

   (a) Using a jack, support the lower arm.

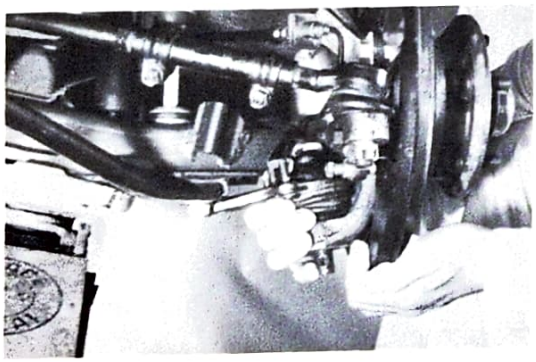
   (b) Using a ball joint puller*, disconnect the lower ball joint from the steering knuckle.

   *SST 09628-62010 or Commercial puller



2. REMOVE LOWER BALL JOINT

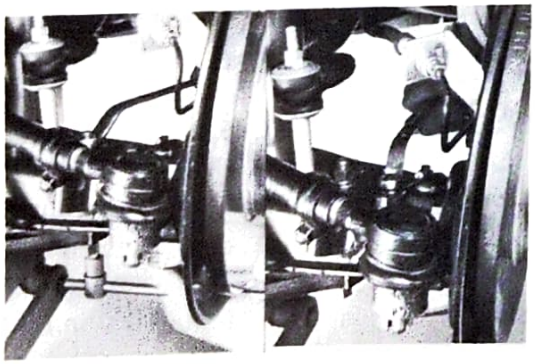
   Remove the bolts and nuts, and remove the lower ball joint from the lower arm.



INSTALLATION OF LOWER BALL JOINT
(See illustration on page 13-12)

1. INSTALL LOWER BALL JOINT

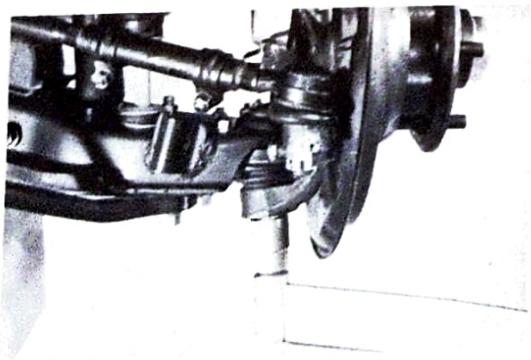
   (a) Install the lower ball joint between the lower arm and steering knuckle.



   (b) Tighten the lower ball joint mounting bolts and nuts.

   Torque:

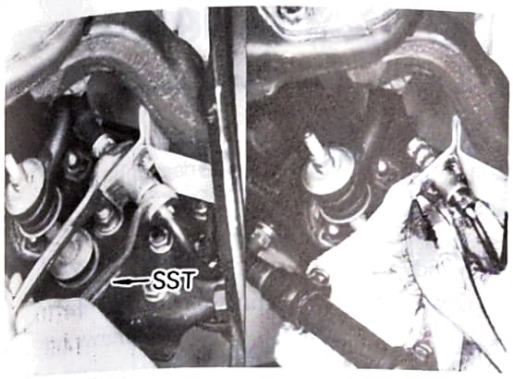
8 mm bolt	**2.0 – 3.0 kg-m (15 – 21 ft-lb)**
10 mm bolt	**4.0 – 5.5 kg-m (29 – 39 ft-lb)**



2. CONNECT BALL JOINT TO STEERING KNUCKLE

   Tighten the castle nut and secure it with a cotter pin.

   Torque: 12.0 – 17.0 kg-m (87 – 122 ft-lb)

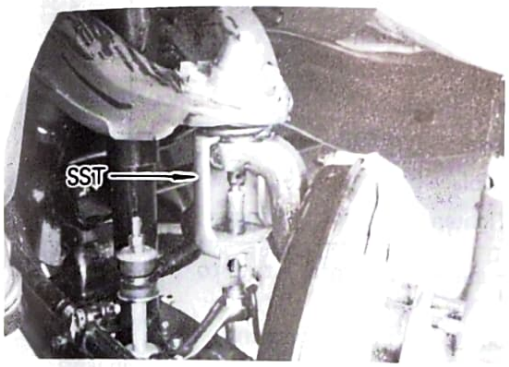


REMOVAL OF UPPER BALL JOINT
(See illustration on page 13-12)

1. DISCONNECT BRAKE HOSE AND TUBE

   Using a flare nut wrench*, disconnect the brake hose from the tube, and remove the clip.

   *SST 09751-36011 or Commercial wrench

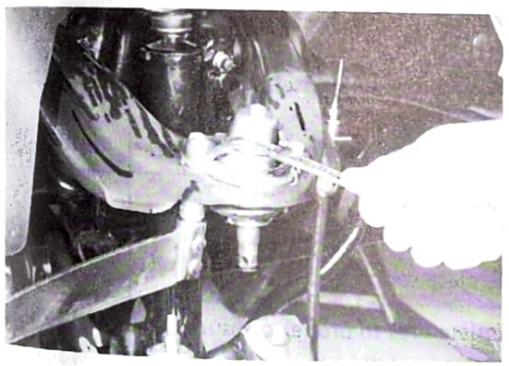


2. DISCONNECT UPPER BALL JOINT FROM STEERING KNUCKLE

   Using a puller*, disconnect the upper ball joint from the steering knuckle.

   *SST 09610-20011 or Commercial puller

3. REMOVE UPPER BALL JOINT FROM UPPER ARM

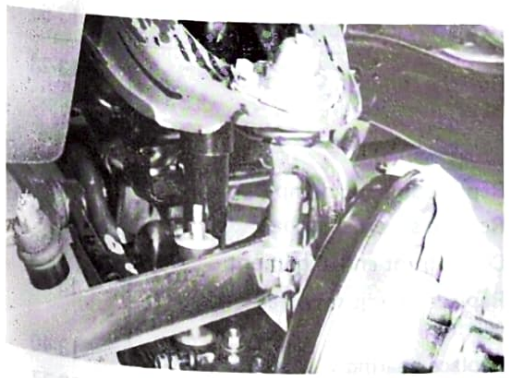


INSTALLATION OF UPPER JOINT
(See illustration on page 13-12)

1. INSTALL UPPER BALL JOINT TO UPPER ARM

   Tighten the upper ball joint mounting bolts and nuts.

   Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)



2. CONNECT UPPER BALL JOINT TO STEERING KNUCKLE

   Tighten the castle nut and secure it with a cotter pin.

   Torque: 9.0 – 13.0 kg-m (66 – 94 ft-lb)

3. CONNECT BRAKE HOSE AND TUBE

   Using a flare nut wrench*, connect the hose and tube. Torque the connection.

   Torque: 1.3 – 1.8 kg-m (10 – 13 ft-lb)

   *SST 09751-36011 or Commercial wrench

4. BLEED BRAKE SYSTEM

TROUBLESHOOTING (RN4×4)

Problem	Possible cause	Remedy	Page
Oil leak at front axle	Oil seals damaged or worn	Replace oil seal	14-7
	Front axle housing cracked	Repair as necessary	
Oil leak at pinion shaft	Oil level too high or wrong grade	Drain and replace oil	2-34
	Oil seal worn or damaged	Replace oil seal	14-10
	Companion flange loose or damaged	Tighten or replace flange	14-9
Noises in front axle	Oil level low or wrong grade	Drain and replace oil	2-34
	Excessive backlash between pinion and ring or side gear	Check backlash	14-13
	Ring, pinion or side gears worn or chipped	Inspect gears	14-15
	Pinion shaft bearing worn	Replace bearing	14-15
	Wheel bearing worn	Replace bearing	13-36
	Differential bearing loose or worn	Tighten or replace bearings	14-17
Wander/pulls	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	13-28
	Alignment incorrect	Check front end alignment	13-28
	Wheel bearing adjusted too tight	Adjust wheel bearing	13-38
	Front or rear suspension parts loose or broken	Tighten or replace suspension part	13-53
	Steering linkage loosen or worn	Tighten or replace steering linkage	16-77
	Steering gear out of adjustment or broken	Adjust or repair steering gear	16-3
Bottoming	Vehicle overloaded	Check loading	
	Shock absorber worn out	Replace shock absorber	13-53
	Springs weak	Replace spring	13-56
Sways/pitches	Tires improperly inflated	Inflate tires to proper pressure	13-28
	Stabilizer bar bent or broken	Inspect stabilizer bar	13-54
	Shock absorber worn out	Replace shock absorber	13-53
Front wheel shimmy	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	13-28
	Wheels out of balance	Balance wheels	
	Steering damper worn out	Replace steering damper	16-78
	Shock absorber worn out	Replace shock absorber	13-53
	Alignment incorrect	Check front end alignment	13-28
	Wheel bearings worn or improperly adjusted	Replace or adjust wheel bearings	13-36
	Steering knuckle bearing worn	Replace bearing	13-40
	Steering linkage loosen or worn	Tighten or replace steering linkage	16-77
	Steering gear out of adjustment or broken	Adjust or repair steering gear	16-3
Abnormal tire wear	Tires improperly inflated	Inflate tire to proper pressure	13-28
	Shock absorbers worn out	Replace shock absorber	13-53
	Alignment incorrect	Check toe-in	13-29

SPECIAL TOOLS AND TEST EQUIPMENT (RN4×4)

Tool	SST No.	Use
Wheel alignment equipment	Commercial	To check front end alignment
Snap ring pliers	09905-00012 or Commercial	To remove snap ring
Flare nut wrench	09751-36011 or Commercial	To loosen and tighten brake line
Wheel bearing adjusting nut wrench	09607-60020	To loosen and tighten wheel bearing adjusting nut
Bearing driver	09608-35013 or Commercial	To install wheel bearing outer race and knuckle spindle bushing
Tie rod end puller	09611-22011 or Commercial	To disconnect steering damper
Steering knuckle bearing cap remover	09606-60020	To remove and install steering knuckle bearing cap
Bearing driver	09605-60010 or Commercial	To install steering knuckle bearing race
Steering knuckle centering gauge	09634-60013	To adjust steering knuckle alignment and bearing preload
Oil seal puller	09308-00010 or Commercial	To remove axle shaft oil seal
Oil seal driver	09618-60010 or Commercial	To install axle shaft oil seal
Bushing collar	09726-35010 or Commercial	To replace torque rod bushing
Bushing plate	09527-10010 or Commercial	To replace torque rod bushing

FRONT WHEEL ALIGNMENT (RN4X4)

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check wheel runout and balance.

(b) Check the front wheel bearings for looseness.

(c) Check the front suspension for looseness.

(d) Check the steering linkage for looseness.

(e) Check that the front absorbers work properly by using the standard bounce test.

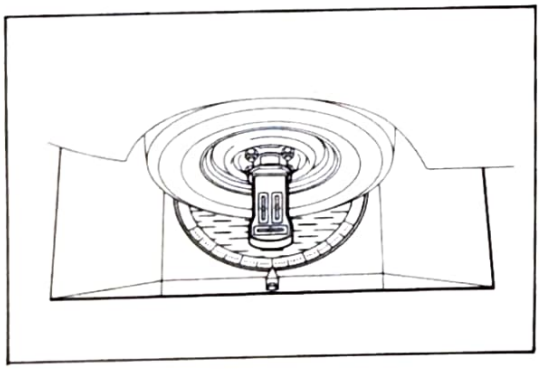
(f) Check the tires for wear and proper inflation.

Cold tire inflation pressure

kg/cm² (psi)

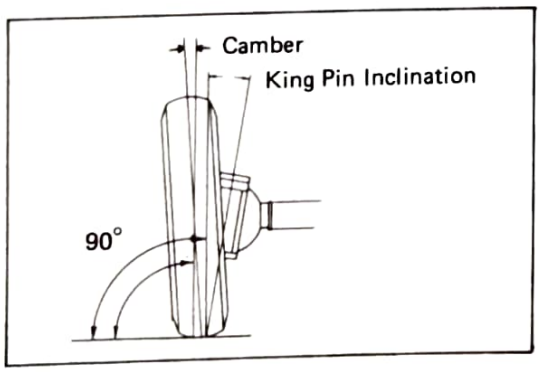
Tire size	Low speed driving		High speed driving	
	Front	Rear	Front	Rear
H78–15B HR78–15B	1.4 (20)	1.7 (24)	1.7 (24)	2.0 (28)

NOTE: For sustained high speeds above 120 km/h (75 mph), add 0.3 kg/cm² (4 psi), but never exceed the maximum cold tire pressure molded on the tire sidewall.



2. INSTALL WHEEL ALIGNMENT EQUIPMENT

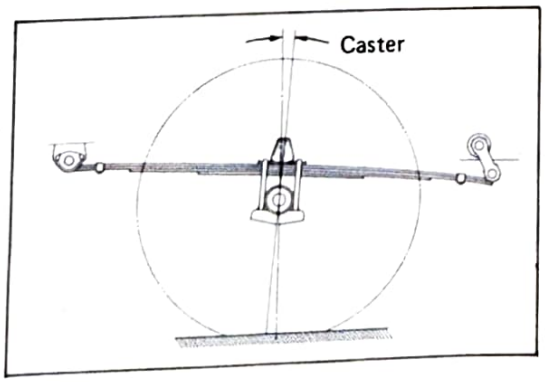
Follow the specific instructions of the equipment manufacturer.



3. CHECK CAMBER AND KING PIN INCLINATION

Camber: 1° ± 45'
King pin inclination: 9°30'

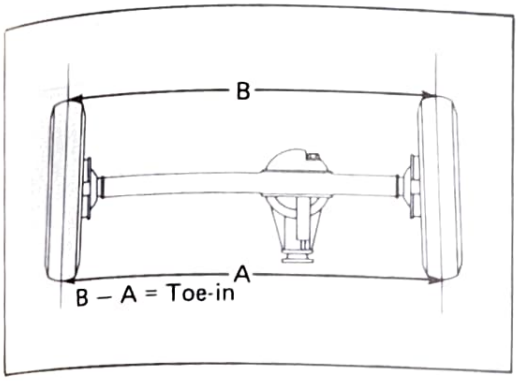
If camber or king pin inclination checks are not within specification, recheck steering knuckle parts and front wheel for bending or looseness.



4. CHECK CASTER

Caster (at unloaded): 3° 30' ± 45'

If caster is not as specified, inspect and replace damaged or worn leaf spring parts.

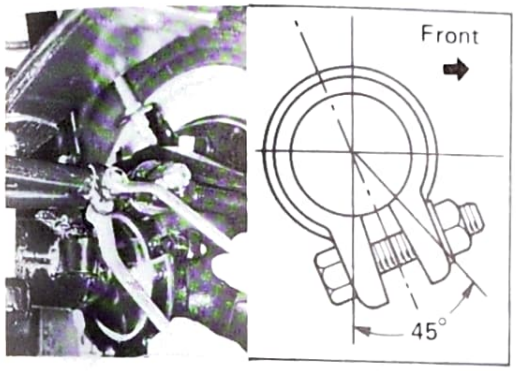


5. ADJUST TOE-IN

Toe-in:

	Inspection STD	Adjustment STD
H78-15 (B) (Bias tire)	4 ± 4 mm (0.16 ± 0.16 in.)	4 ± 1 mm (0.16 ± 0.04 in.)
HR78-15 (B((Radial tire)	1 ± 4 mm (0.04 ± 0.16 in.)	1 ± 1 mm (0.04 ± 0.04 in.)

NOTE: The toe-in should be measured at the same point on the tire and at the same level.



(a) Make sure the steering gear is centered.

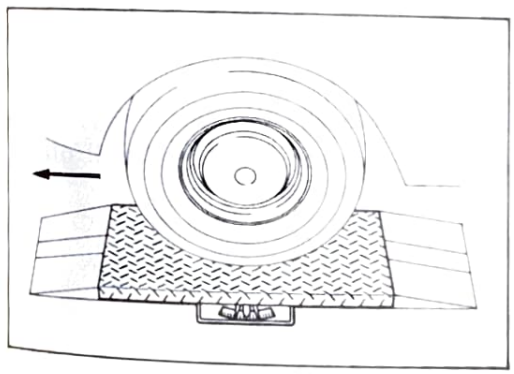
(b) Loosen nuts holding the clamps on the tie rod.

(c) Adjust toe-in to the correct value by turning the tie rod.

(d) Torque nuts holding the clamps.

Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)

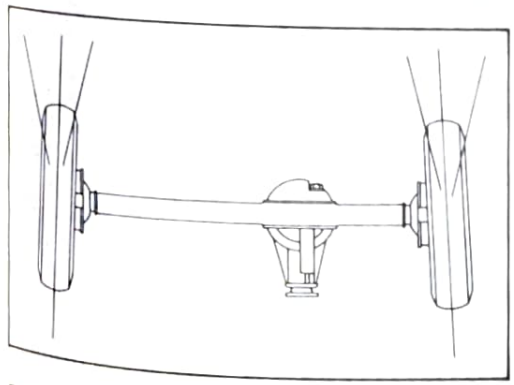
NOTE: The steering damper side clamp opening must be positioned at the front of the tie rod, and face within 45° from straight down as shown in the figure.



6. CHECK SIDE SLIP WITH SIDE SLIP TESTER

Side slip: Less than 3.0 mm/m (0.118 in./3.3 ft)

If the side slip exceeds the limit, the toe-in or other front wheel alignment may not be correct.

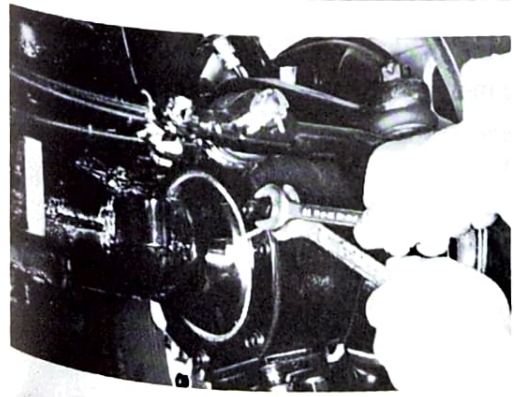


7. CHECK STEERING ANGLES

NOTE: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

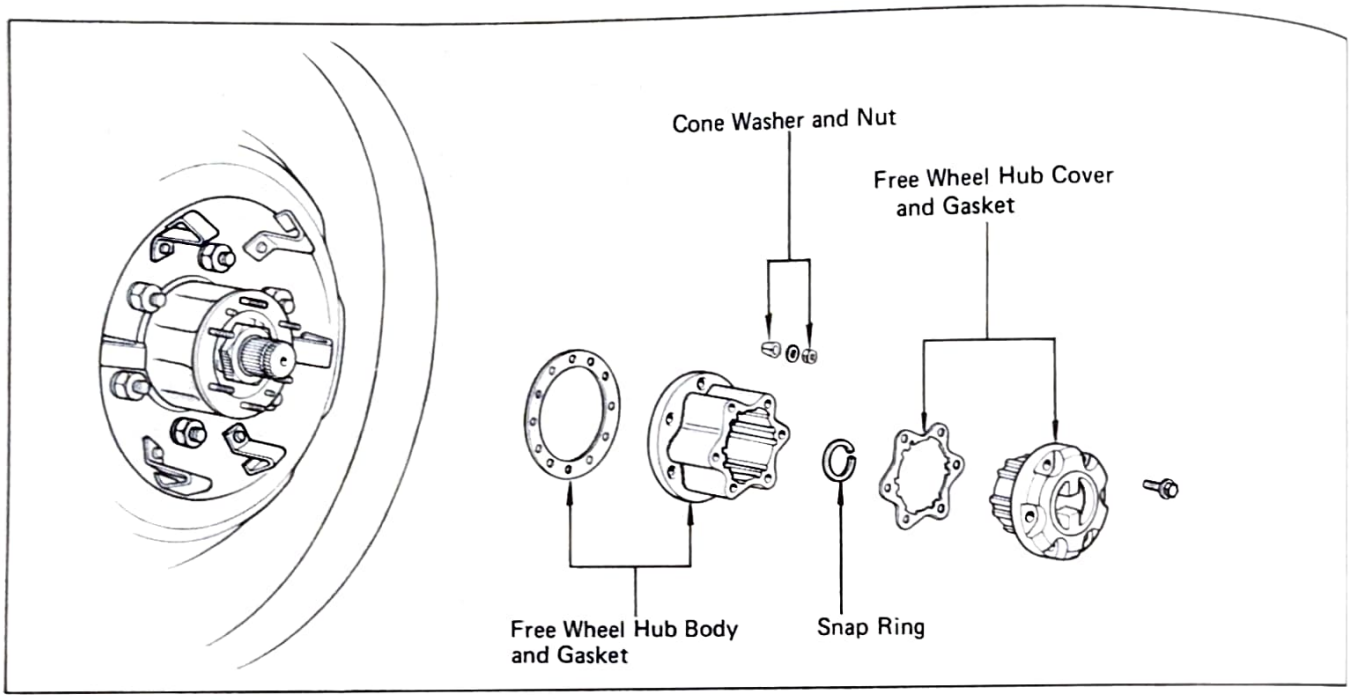
Wheel angle:

Inside	30° 30' (+1, –2)
Outside	29°



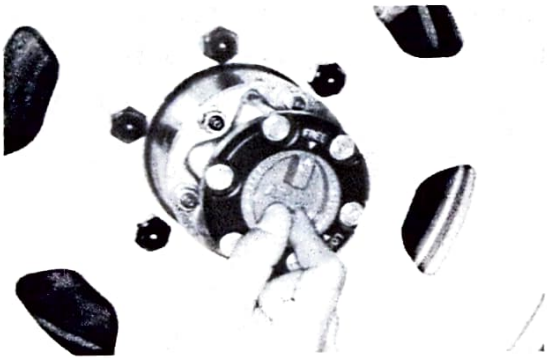
If steering angles differ from standard value, adjust the steering angle with knuckle stopper bolts. If the steering angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.

FREE WHEEL HUB (RN4×4)



REMOVAL OF FREE WHEEL HUB

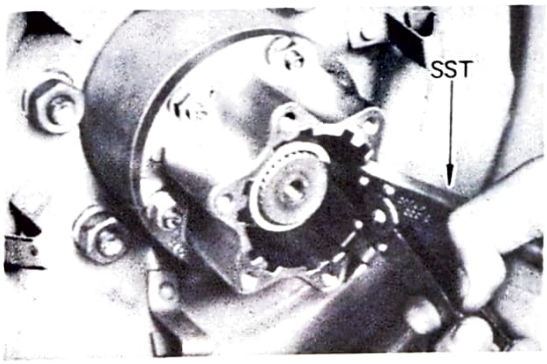
1. REMOVE FREE WHEEL HUB COVER



(a) Set the control handle to FREE.

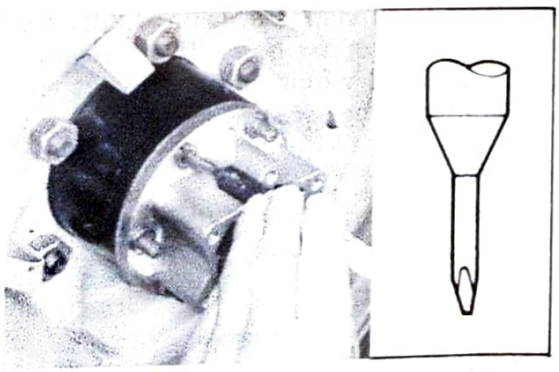
(b) Remove the cover mounting bolts and pull off the cover.

2. REMOVE SNAP RING



Using snap ring pliers, remove the snap ring.

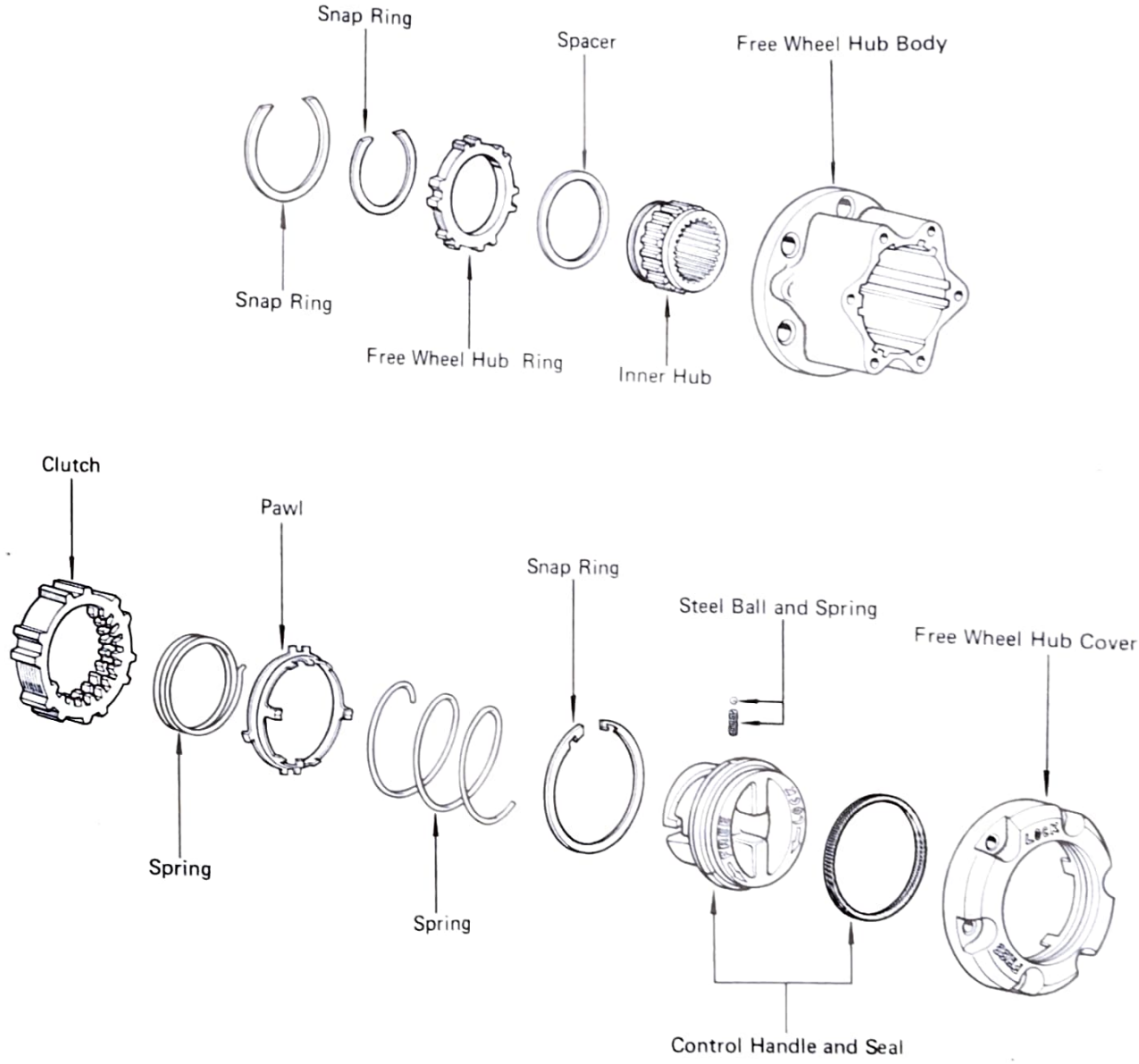
3. REMOVE FREE WHEEL HUB BODY

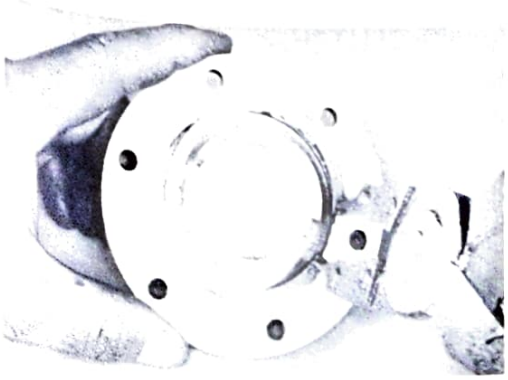


(a) Remove the mounting nuts.

(b) Using a tapered punch, tap on the slits of the cone washers and remove them.

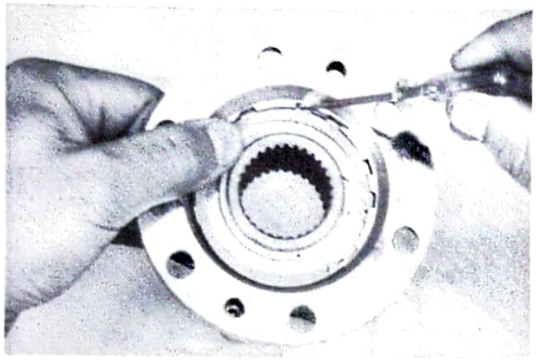
(c) Pull off the free wheel hub body from the axle hub.





DISASSEMBLY OF FREE WHEEL HUB

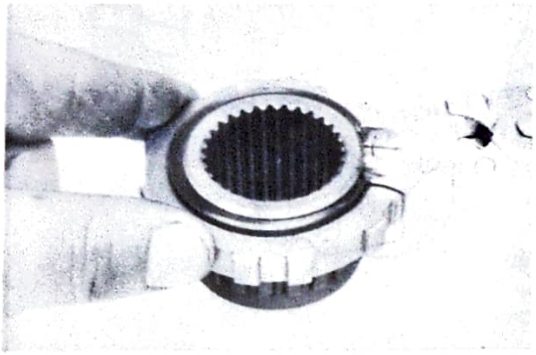
1. REMOVE CONTROL HANDLE FROM FREE WHEEL HUB COVER
   (a) Using snap ring pliers, remove the snap ring.
   (b) Remove the control handle from the cover.
   (c) Remove the steel ball and spring from the control handle.



2. REMOVE INNER HUB AND FREE WHEEL HUB RING FROM FREE WHEEL HUB BODY

(a) Using a screwdriver, remove the snap ring.

(b) Remove the inner hub and free wheel hub ring from the body.



3. REMOVE FREE WHEEL HUB RING FROM INNER HUB

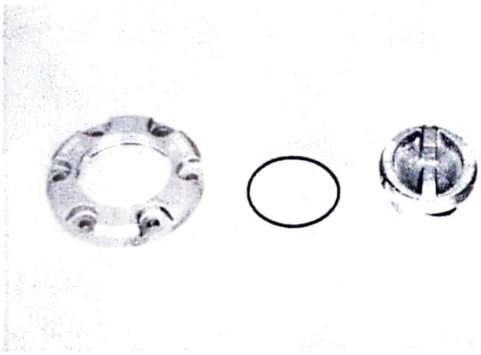
(a) Using snap ring pliers, remove the snap ring.

(b) Remove the free wheel hub ring and spacer from the inner hub.

INSPECTION OF FREE WHEEL HUB

1. INSPECT COVER, HANDLE AND SEAL

(a) Inspect the cover, handle and seal for wear or damage.

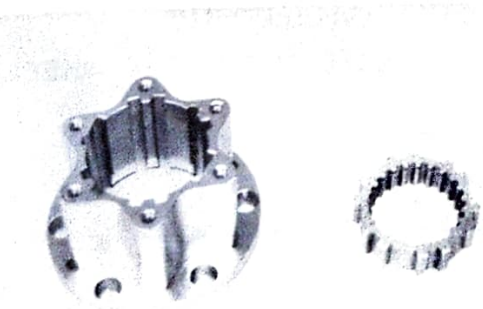


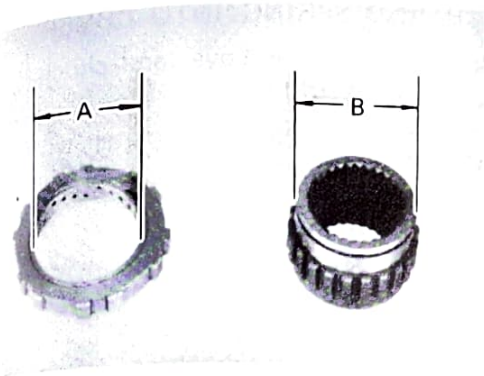
(b) Temporarily install the handle in the cover and check that the handle moves smoothly and freely.

2. INSPECT BODY AND CLUTCH

(a) Inspect the body and clutch for wear or damage.

(b) Check that the clutch moves smoothly in the body.

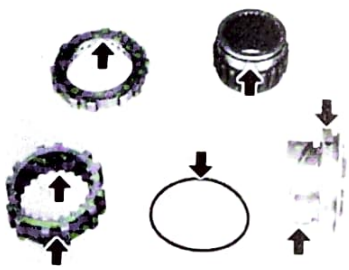




3. INSPECT INNER HUB AND FREE WHEEL HUB RING

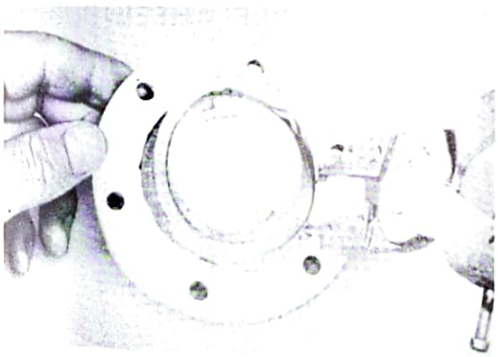
Inspect the inner hub and free wheel hub ring for wear or damage.

Oil clearance (A–B): 0.3 mm (0.012 in.)



ASSEMBLY OF FREE WHEEL HUB
(See illustration on page 13-31)

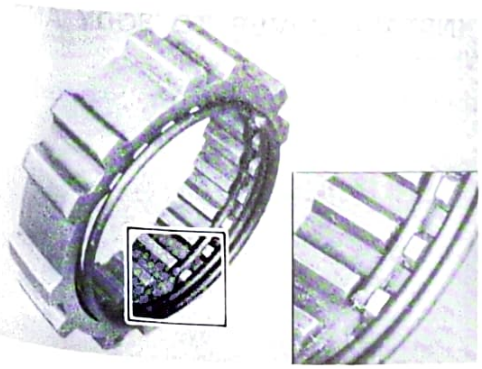
1. APPLY MULTIPURPOSE GREASE TO SLIDING SURFACE OF PARTS



2. INSTALL CONTROL HANDLE TO COVER

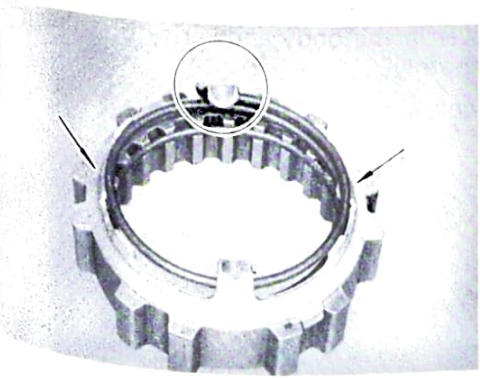
(a) Install the seal, spring and steel ball to the handle.

(b) Insert the handle in the cover and install the snap ring with snap ring pliers.



3. INSTALL TENSION SPRING IN CLUTCH

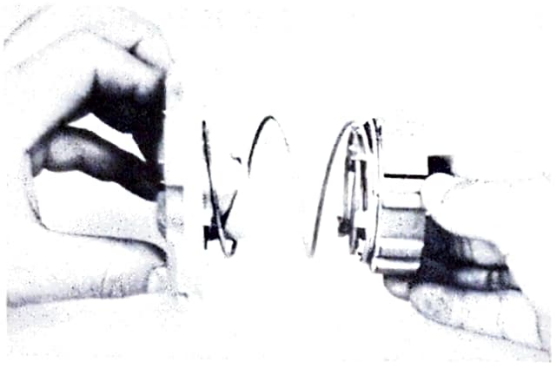
Install the tension spring in the clutch with the spring end aligned with the initial groove.



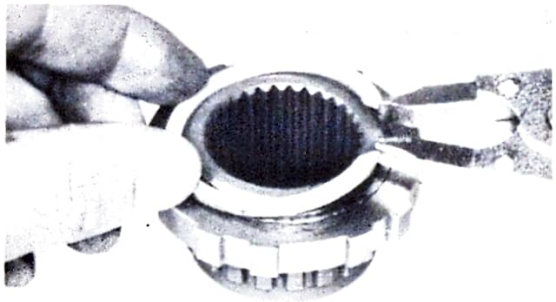
4. INSTALL FOLLOWER PAWL TO CLUTCH

(a) Place the follower pawl on the tension spring with one of the large tabs against the bent spring end.

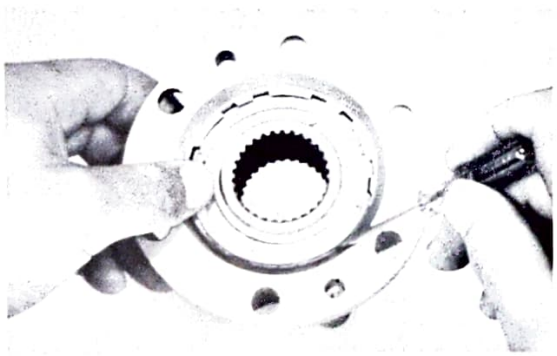
(b) Place the top ring of the spring on the small tabs.



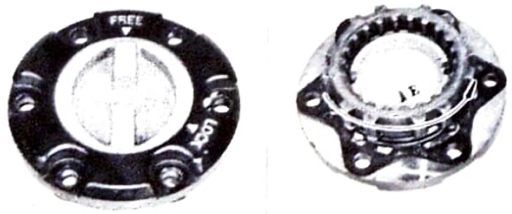
5. INSTALL CLUTCH AND SPRING INTO COVER
   (a) Place the spring between the cover and clutch with the large spring end toward the cover.
   (b) Compress the spring and install the clutch with the pawl tab fit to the handle cam.



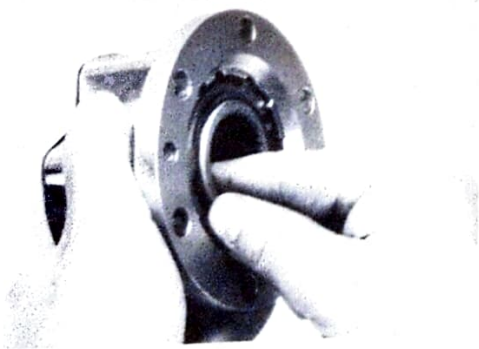
6. INSTALL SPACER AND FREE WHEEL HUB RING TO INNER HUB
   (a) Install the spacer and free wheel hub ring to the inner hub.
   (b) Using snap ring pliers, install the snap ring.



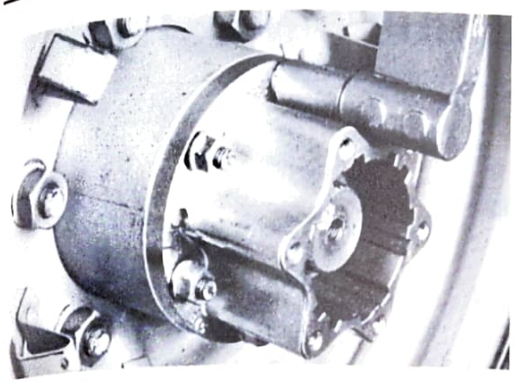
7. INSTALL INNER HUB AND FREE WHEEL HUB RING IN FREE WHEEL HUB BODY
   (a) Insert the inner hub and free wheel hub ring in the body.
   (b) Using a screwdriver, install the snap ring.



8. TEMPORARILY INSTALL COVER TO BODY AND CHECK FREE WHEEL HUB
   (a) Set the control handle and clutch to the free position.



   (b) Insert the cover in the body and verify that the inner hub turns smoothly.
   (c) Remove the cover from the body.



INSTALLATION OF FREE WHEEL HUB
(See illustration on page 13-30)

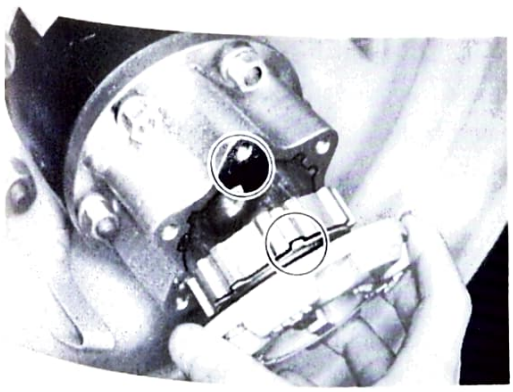
1. INSTALL FREE WHEEL HUB BODY WITH NEW GASKET
   (a) Place the gasket in position on the front axle hub.
   (b) Install the free wheel hub body with six cone washes and nuts. Tighten the nuts.

   Torque: 2.8 – 3.5 kg-m (21 – 25 ft-lb)

2. INSTALL SNAP RING
   (a) Install a bolt in the axle shaft and pull it out.
   (b) Using snap ring pliers, install the snap ring.
   (c) Remove the bolt.

3. APPLY MULTIPURPOSE GREASE TO INNER HUB SPLINES

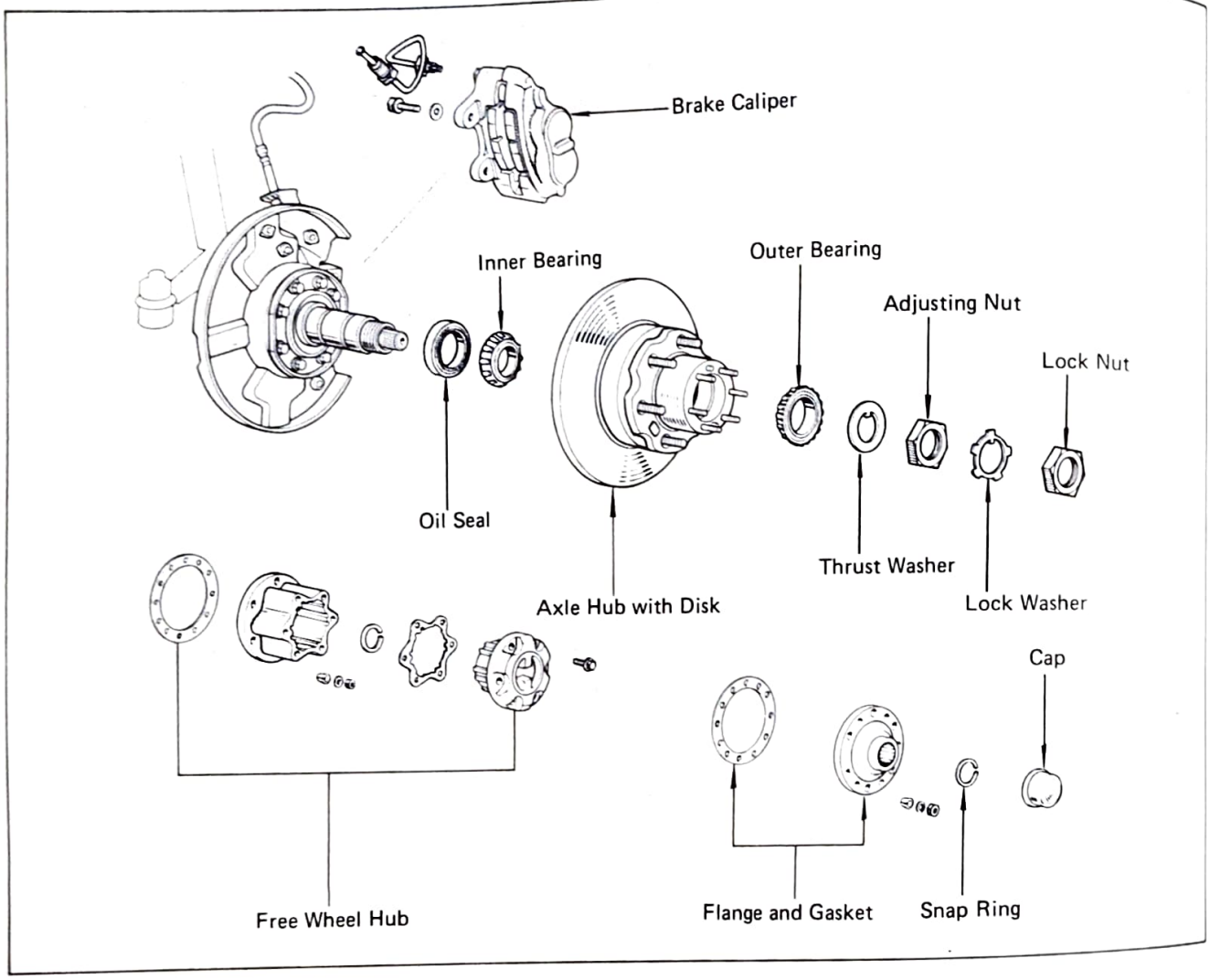
4. INSTALL FREE WHEEL HUB COVER WITH NEW GASKET
   (a) Set the control handle and clutch to the free position.
   (b) Place the gasket in position on the cover.

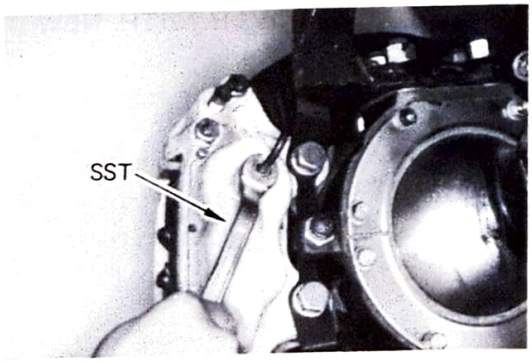


   (c) Install the cover to the body with the follower pawl tabs aligned with the non-toothed portions of the body.
   (d) Tighten the cover mounting bolts.

   Torque: 0.8 – 1.2 kg-m (70 – 104 in.-lb)

FRONT AXLE HUB (RN4×4)





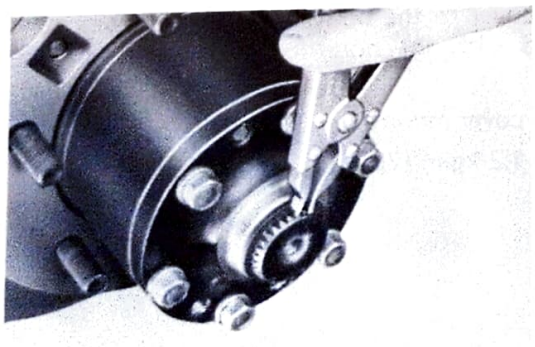
REMOVAL OF FRONT AXLE HUB

1. REMOVE DISC BRAKE CALIPER

(a) Using a flare nut wrench*, disconnect the brake tube.

*SST 09751-36011 or Commercial wrench

(b) Remove the disc brake caliper from the steering knuckle.

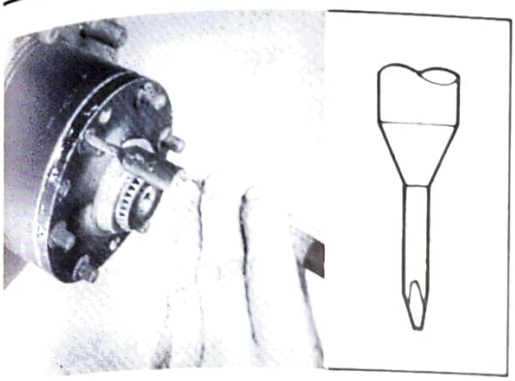


2. REMOVE FLANGE OR FREE WHEEL HUB

NOTE: In case of the free wheel hub, see page 13-30.

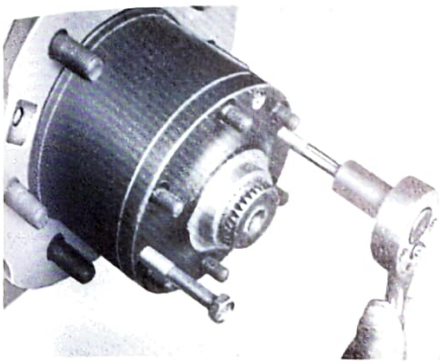
(a) Remove the cap from the flange.

(b) Using snap ring pliers, remove the snap ring.

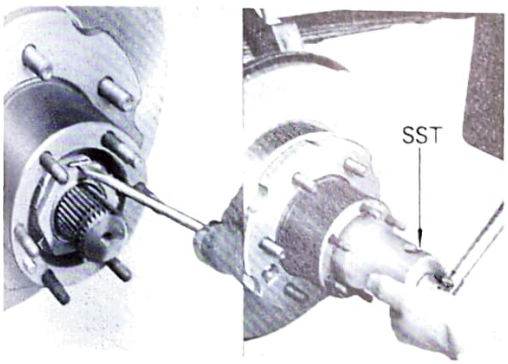


(c) Remove the mounting nuts.

(d) Using a tapered punch, tap the slits of the cone washers and remove them.



(e) Install and tighten two bolts, and remove the flange.



3. REMOVE AXLE HUB WITH DISC

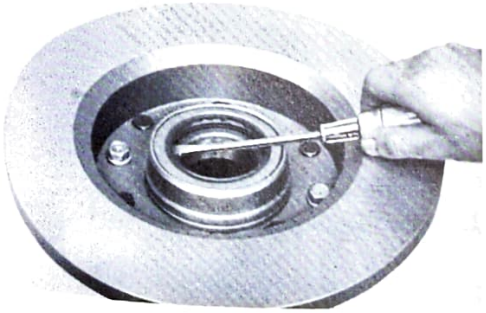
(a) Using a screwdriver, release the lock washer.

(b) Using SST*, remove the lock nut.

*SST 09607-60020

(c) Remove the lock washer and adjusting nut.

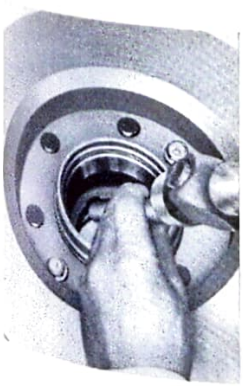
(d) Remove the axle hub with the disc.

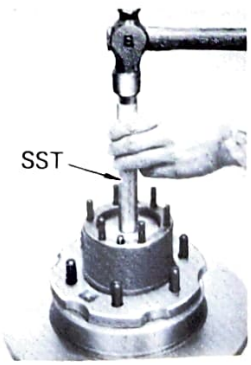


4. REMOVE THRUST WASHER AND OUTER BEARING

5. REMOVE OIL SEAL AND INNER BEARING

Using a screwdriver, pry out the oil seal.





INSPECTION OF FRONT AXLE HUB (See page 13-8)

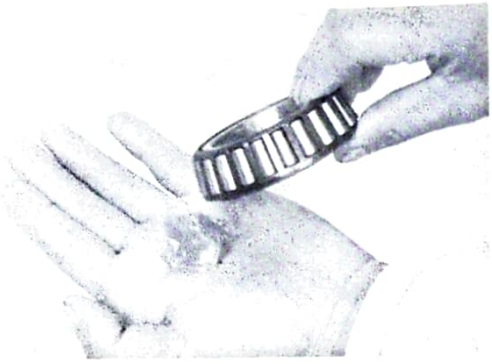
IF NECESSARY, REPLACE BEARING RACE

(a) Using a brass bar, drive out the bearing race.

(b) Using a bearing driver*, carefully drive in the new race.

*SST 09608-35013 or Commercial driver

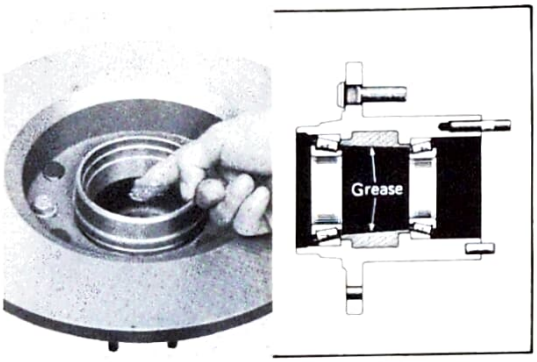
ASSEMBLY OF FRONT AXLE HUB
(See illustration on page 13-36)



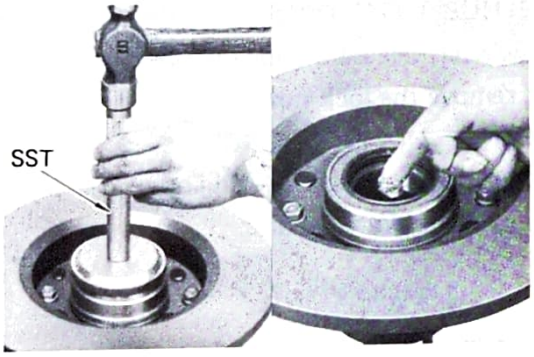
1. PACK BEARINGS WITH MULTIPURPOSE GREASE

Place some grease in your hand and force grease into bearing until completely filled.

NOTE: If available, use a pressure bearing lubricator.



2. COAT INSIDE OF HUB WITH MULTIPURPOSE GREASE



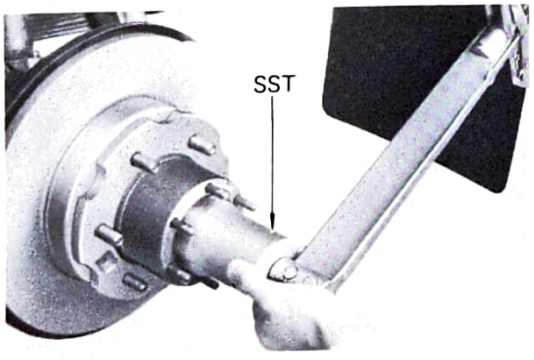
3. INSTALL INNER BEARING AND OIL SEAL

Place inner bearing into the hub. Using a seal driver, drive the oil seal into the hub. Coat the oil seal with multi purpose grease.

4. INSTALL AXLE HUB ON SPINDLE

(a) Place the axle hub on the spindle.

(b) Install the outer bearing and thrust washer.



5. ADJUST PRELOAD

(a) Install and torque the nut.

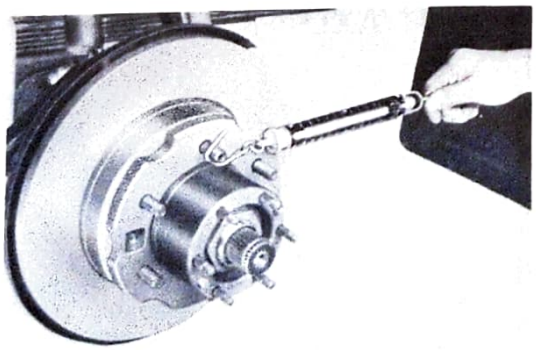
Torque: 6.0 kg-m (43 ft-lb)

(b) Turn the hub right and left two or three times.

(c) Loosen the nut until it can be turned by hand.

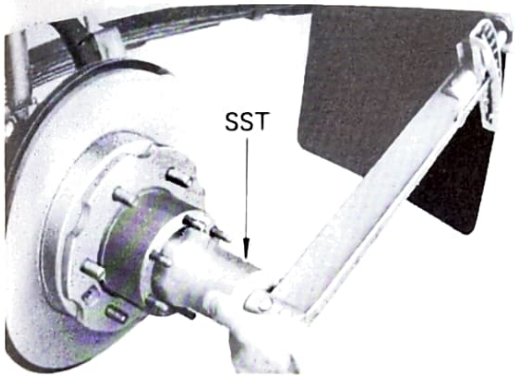
(d) Retighten the adjusting nut.

Torque: 0.4 – 0.7 kg-m (35 – 60 in.-lb)



(e) Using a spring tension gauge, check the preload.

Preload (at starting): 2.8 – 5.7 kg (6.2 – 12.6 lb)



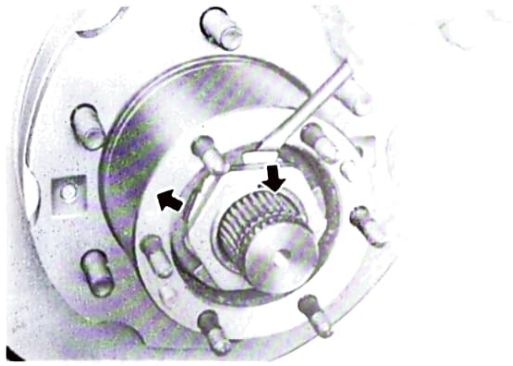
6. INSTALL LOCK WASHER AND LOCK NUT

(a) Install the lock washer and lock nut.

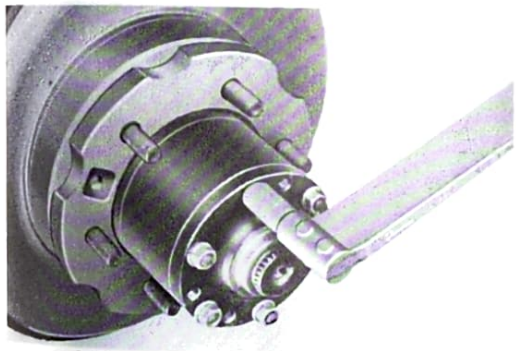
(b) Using SST*, tighten the lock nut.

*SST 09607-60020

Torque: 8.0 – 10.0 kg-m (58 – 72 ft-lb)



(c) Secure the lock nut by bending one of the lock washer teeth inward and another lock washer teeth outward.



7. INSTALL FLANGE OR FREE WHEEL HUB

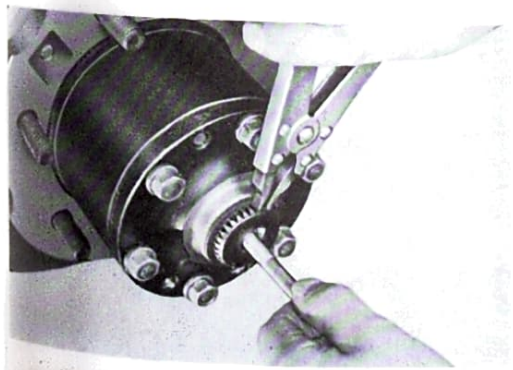
NOTE: In case of the free wheel hub, see page 13-35.

(a) Place the gasket in position on the axle hub.

(b) Install the flange to the axle hub.

(c) Install six cone washers and nuts.
Tighten the nuts.

Torque: 2.8 – 3.5 kg-m (21 – 25 ft-lb)

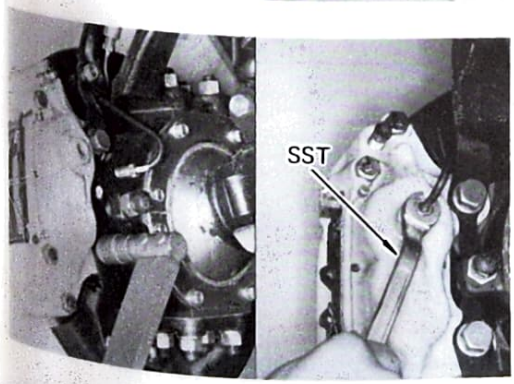


(d) Install a bolt in the axle shaft and pull it out.

(e) Using snap ring pliers, install the snap ring.

(f) Remove the bolt.

(g) Install the cap to the flange.



8. INSTALL BRAKE CALIPER

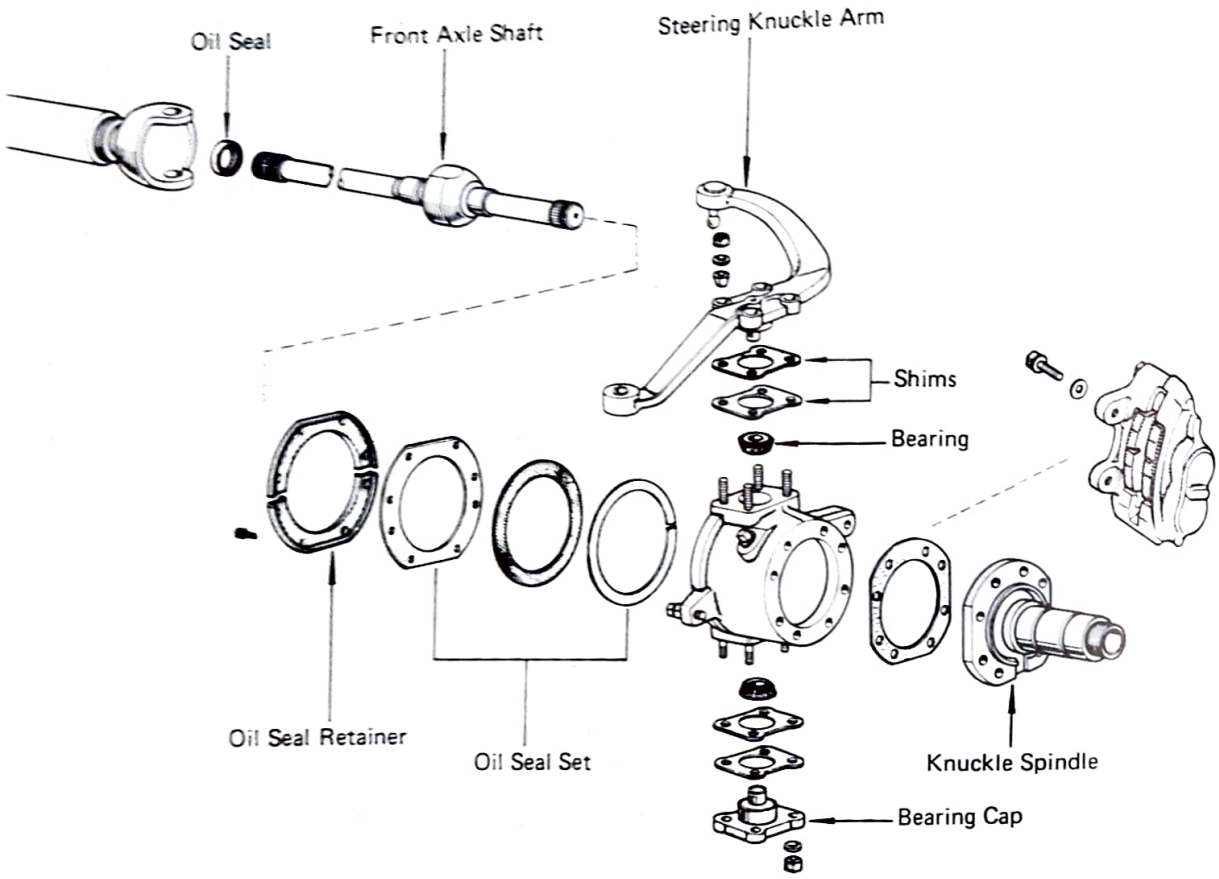
(a) Install the brake caliper to the steering knuckle.
Tighten the mounting bolts.

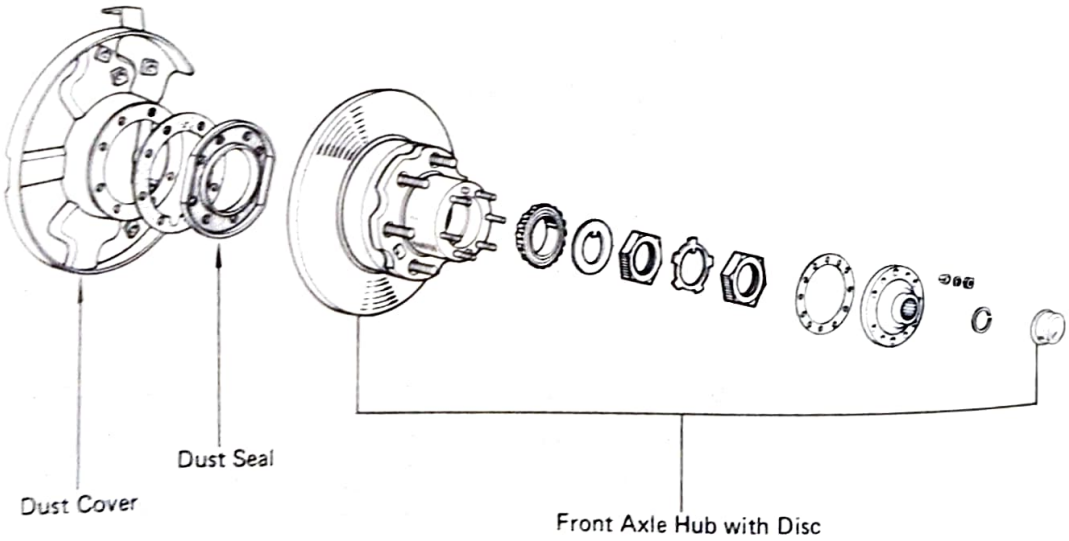
Torque: 7.5 – 10.5 kg-m (55 – 75 ft-lb)

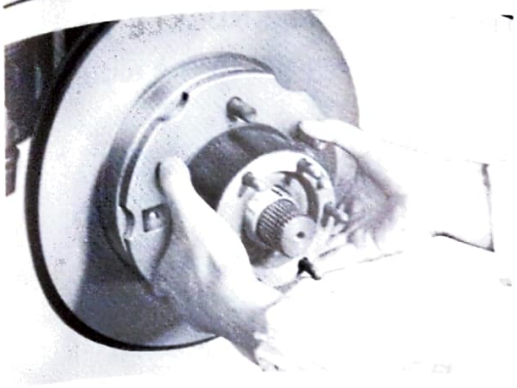
(b) Using a flare nut wrench*, connect the brake tube.

*SST 09751-36011 or Commercial wrench

STEERING KNUCKLE AND AXLE SHAFT (RN4X4)

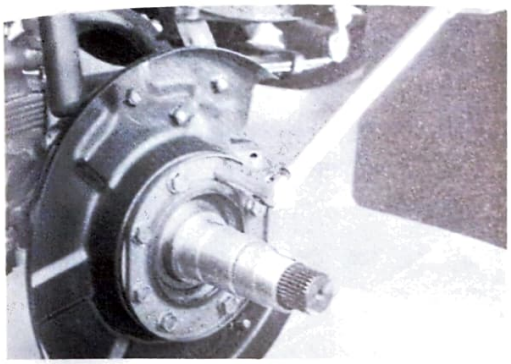






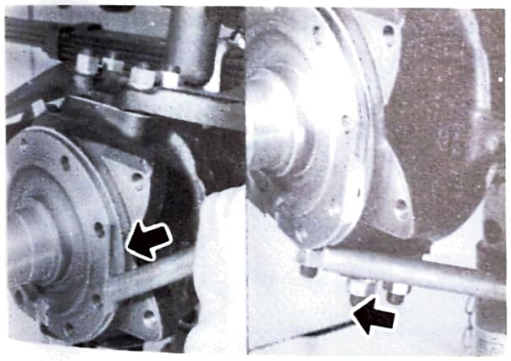
DISASSEMBLY OF STEERING KNUCKLE AND AXLE SHAFT

1. REMOVE FRONT AXLE HUB
(See page 13-36)



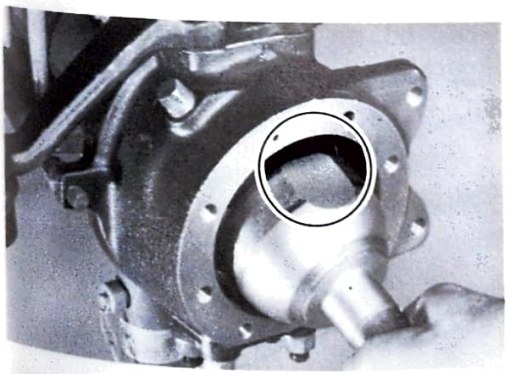
2. REMOVE KNUCKLE SPINDLE MOUNTING BOLTS

3. REMOVE DUST SEAL AND DUST COVER



4. REMOVE KNUCKLE SPINDLE

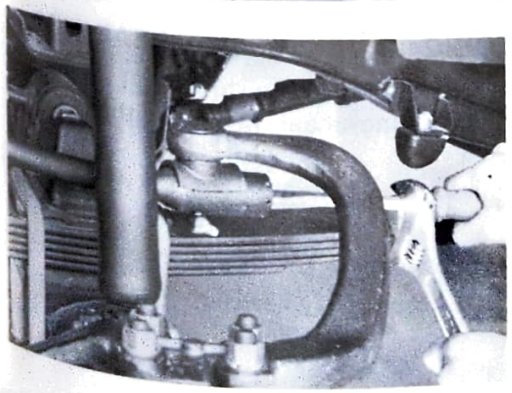
Using a brass bar, tap the knuckle spindle off of the steering knuckle.



5. REMOVE AXLE SHAFT

Position one flat part of the outer shaft upward and pull out the axle shaft.

6. REMOVE OIL SEAL SET RETAINER

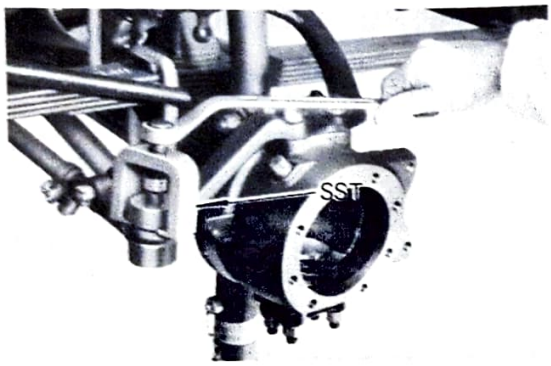


7. DISCONNECT DRAG LINK FROM KNUCKLE ARM

(a) Remove the cotter pin from the drag link end.

(b) Using a screwdriver, remove the plug.

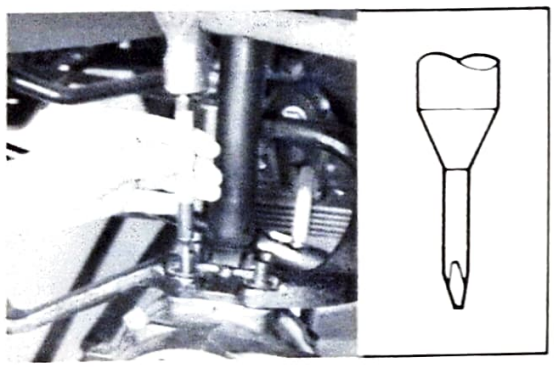
(c) Disconnect the drag link from the knuckle arm.



8. **DISCONNECT TIE ROD FROM KNUCKLE ARM**

Using a ball joint puller*, disconnect the tie rod from the knuckle arm.

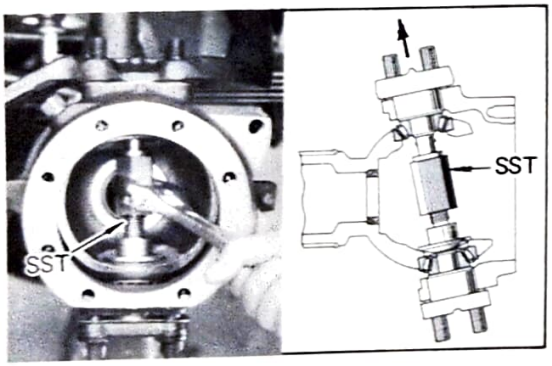
*SST 09611-22011 or Commercial puller



9. **REMOVE KNUCKLE ARM AND BEARING CAP**

(a) Remove the knuckle arm and bearing cap mounting nuts.

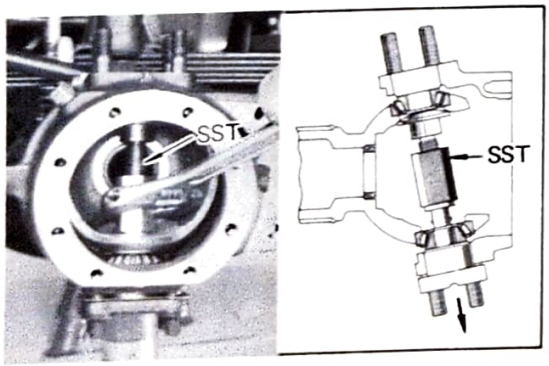
(b) Using a tapered punch, tap the slits of the cone washers and remove them from the knuckle arm.



(c) Using SST*, push out the knuckle arm and shims from the steering knuckle.

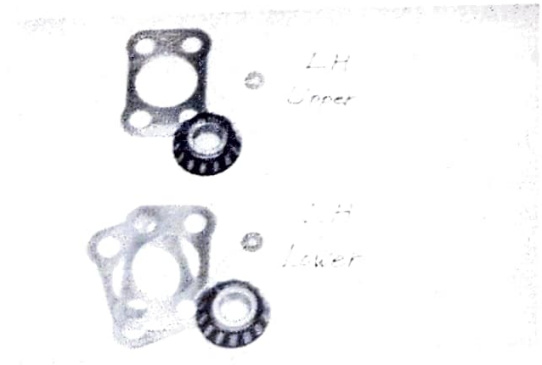
*SST 09606-60020

NOTE: Use the SST without a collar.



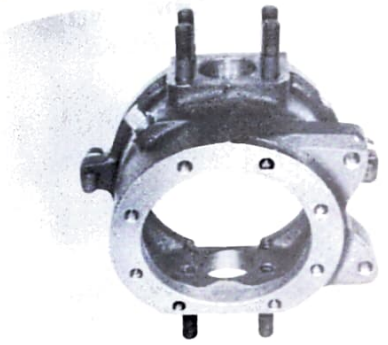
(d) Using SST*, push out the bearing cap and shims from the steering knuckle.

*SST 09606-60020



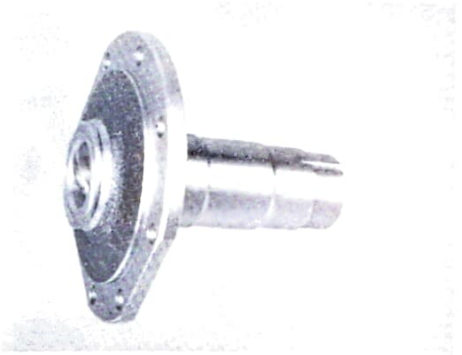
10. **REMOVE STEERING KNUCKLE AND BEARINGS**

NOTE: Mark the removed adjusting shims and bearings so as to enable reassembling them back to their proper positions.



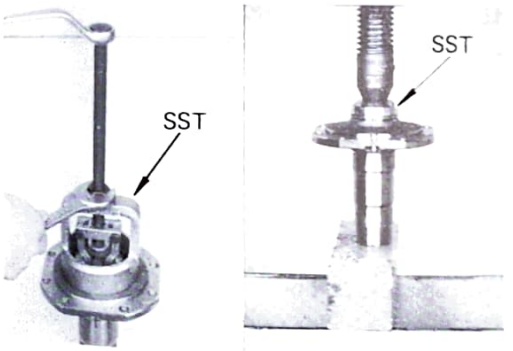
INSPECTION OF STEERING KNUCKLE AND AXLE SHAFT

1. CLEAN AND INSPECT STEERING KNUCKLE FOR DAMAGE OR CRACKS



2. CLEAN AND INSPECT KNUCKLE SPINDLE
   (a) Check the spindle for wear or damage.
   (b) Check the bushing for wear or damage.

   If the bushing is worn or damaged replace it.

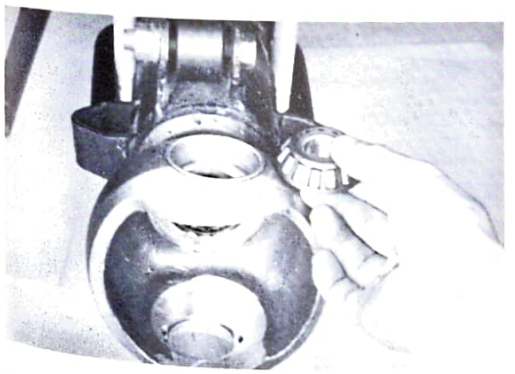


3. IF NECESSARY, REPLACE BUSHING
   (a) Using a steering worm bearing puller*, remove the bushing.

   *SST 09612-65013

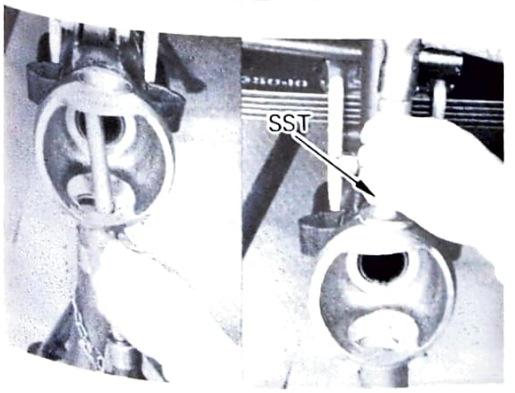
   (b) Using a driver*, press in the new bushing into the spindle.

   *SST 09608-35013 or Commercial driver



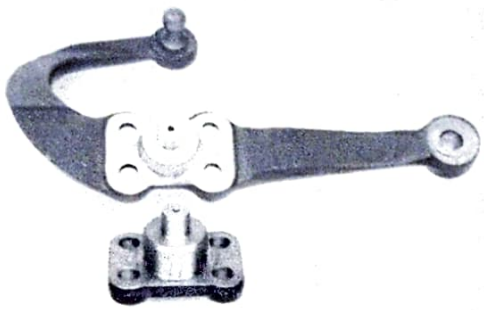
4. CLEAN AND INSPECT KNUCKLE BEARINGS AND RACES
   (a) Clean with solvent and dry with low-pressure compressed air.
   (b) Inspect the bearings and races for wear or damage.

   If a bearing or race requires replacement, it must be replaced as a set.



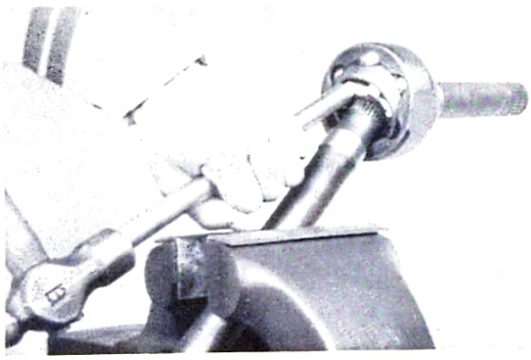
5. IF NECESSARY, REPLACE BEARING RACE
   (a) Using a brass bar, drive out the bearing race.
   (b) Using a bearing driver*, carefully drive in the new race.

   *SST 09605-60010 or Commercial driver



6. CLEAN AND INSPECT KNUCKLE ARM AND BEARING CAP FOR DAMAGE OR CRACKS

7. INSPECT AXLE SHAFT
   (a) Inspect the inner and outer shafts for wear or damage.
   (b) Inspect the Birfield joint for excessive looseness.

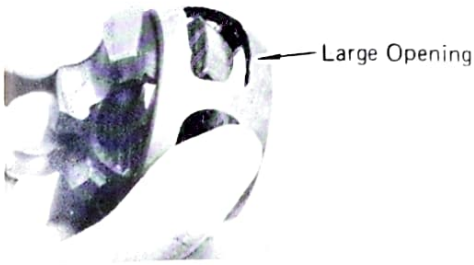


8. INSPECT BIRFIELD JOINT INNER PARTS
   (a) Hold the inner shaft in a vise.
   (b) Place a brass bar against the joint inner race and drive out the outer shaft.

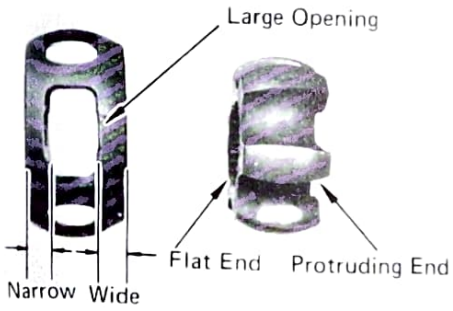
   (c) Tilt the inner race and cage and take out the bearing balls one by one.

   (d) Fit the two large openings in the cage against the protruding parts of the outer shaft, and pull out the cage and inner race.

(e) Take out the inner race from the cage through the large opening.



(f) Clean and inspect the joint inner parts for wear or damage.

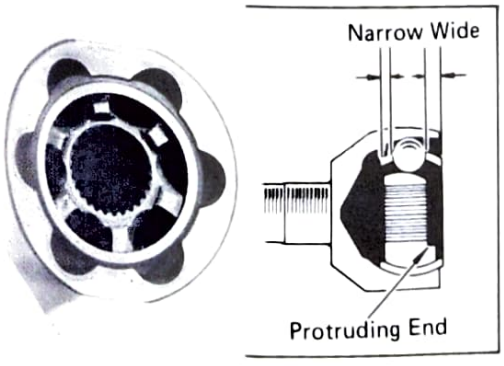


(g) Coat the joint inner parts and outer shaft inside with molybdenum disulphide grease.

(h) Insert the inner race in the cage through the large opening.

(i) Position the protruding end of the inner race toward the wide side of the cage.

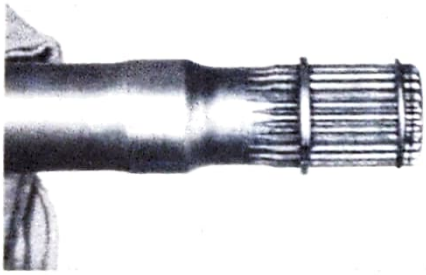
(j) Assemble the cage and inner race to the outer shaft by fitting the two large openings in the cage against the protruding parts of the outer shaft.



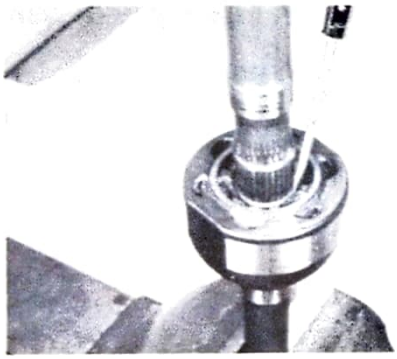
(k) Make sure to position the wide side of the cage and the inner race protruding end outward.

(l) Fit in the inner race and cage, and install the six bearing balls in the outer shaft.

(m) Pack molybdenum disulphide lithium base grease in the outer shaft.



(n) Install the new snap rings on the inner shaft.



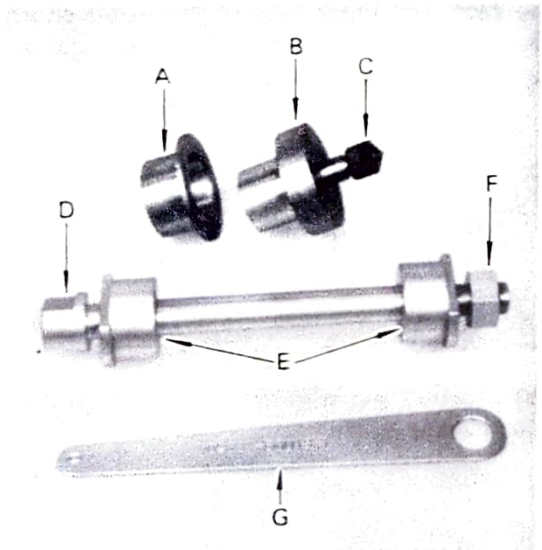
(o) Hold the outer shaft in a vise and, while compressing the snap ring (inner), install the inner shaft to the outer shaft.

(p) Verify that the inner shaft cannot be pulled out.

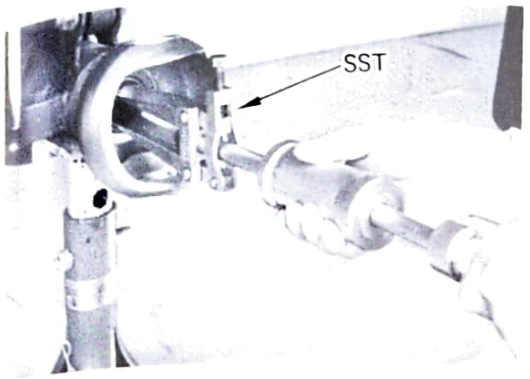
ADJUSTMENT OF STEERING KNUCKLE ALIGNMENT AND BEARING PRELOAD

NOTE: Whenever the axle housing or the steering knuckle is replaced, the steering knuckle alignment and knuckle bearing preload are to be adjusted with the SST* shown in the figure.

*SST 09634-60013



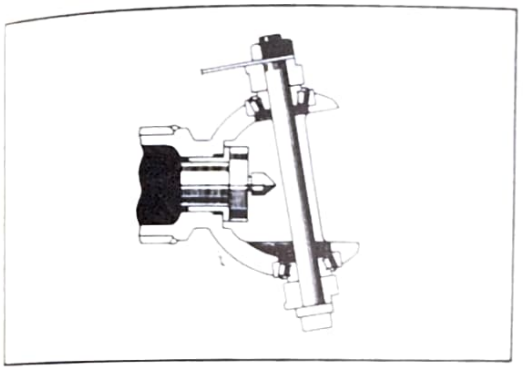
A. Adapter Ring
B. Adapter
C. Plug
D. Rod
E. Attachment
F. Nut
G. Lever



1. ADJUST BEARING PRELOAD

(a) Using a puller*, remove the oil seal.

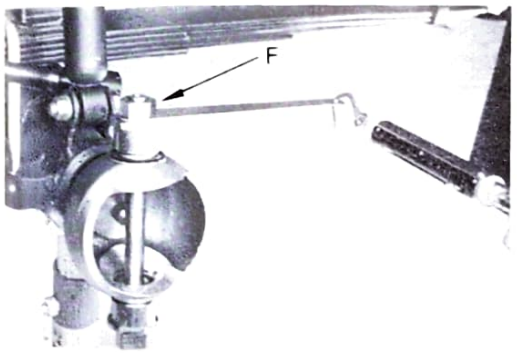
*SST 09308-00010 or Commercial puller



(b) Coat knuckle bearings lightly with molybdenum disulphide lithium base grease.

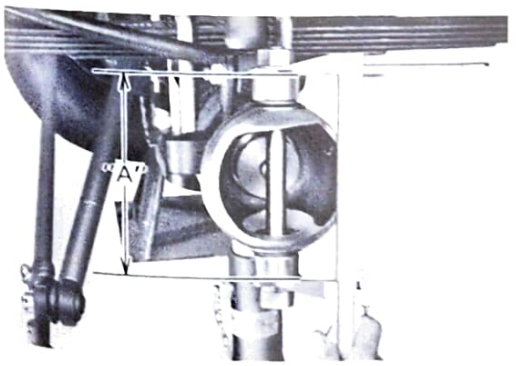
(c) Mount the SST* on the housing with the bearings.

*SST 09634-60013

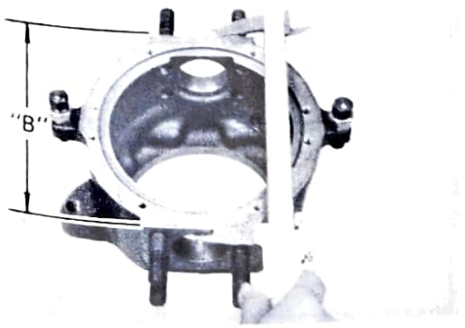


(d) Add preload to the bearings by tightening nut F.
Using a spring tension gauge, measure the preload.

Preload (rotating): 1.8 – 3.8 kg (4.0 – 8.4 lb)



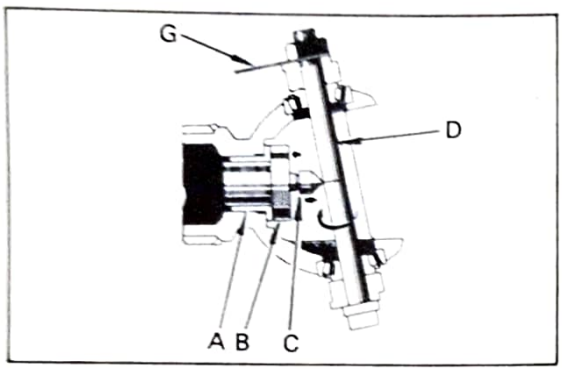
(e) Measure distance "A".



(f) Measure distance "B".

The difference between "A" and "B" is the total adjusting shim thickness that is required to maintain the correct bearing preload.

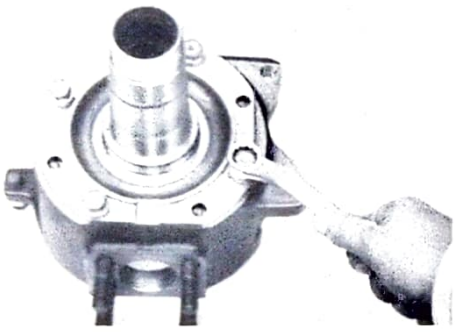
TOTAL SHIM THICKNESS "C"
"C" = "A" – "B"



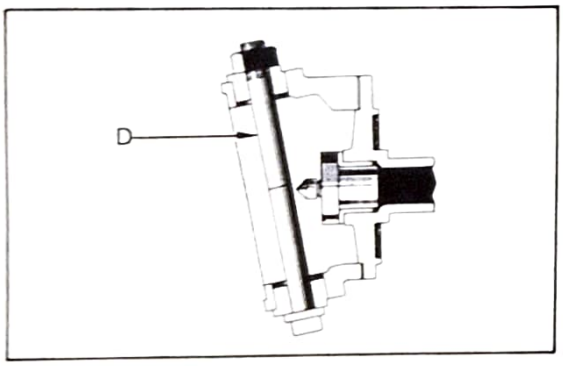
2. ADJUST STEERING KNUCKLE ALIGNMENT

(a) Apply a light coat of red lead on the center part of rod D.

(b) Press adapters A and B against the housing, press plug C against the rod D, and turn lever G so that a line will be scribed on rod D.



(c) Temporarily install the spindle to the knuckle. Tighten the bolt with two washers.

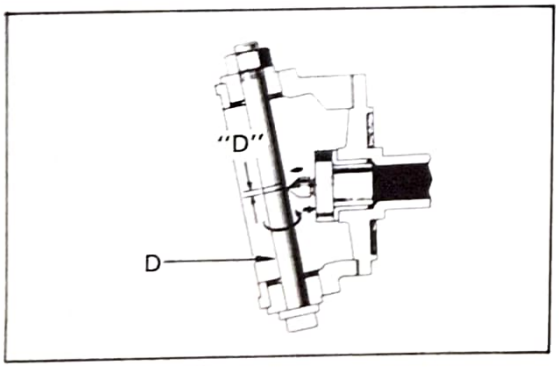


(d) Dismount the SST* from the housing, and mount it on the knuckle.

*SST 09634-60013

NOTE: Use care not to erase the scribed line when dismounting and remounting the SST.

Make sure that rod D is in the same vertical direction that it was when mounted on the housing.



(e) Turn rod D and scribe another line on it.
Measure distance **"D"** between the two scribed lines.

The thickness of the steering knuckle lower bearing shim **"E"** will be the distance **"D"** less 3 mm (0.12 in.).

LOWER SHIM THICKNESS "E"

"E" = "D" – 3 mm

The thickness of the steering knuckle upper bearing shim **"F"** will be the difference between the total adjusting shim thickness **"C"** and shim thickness "E".

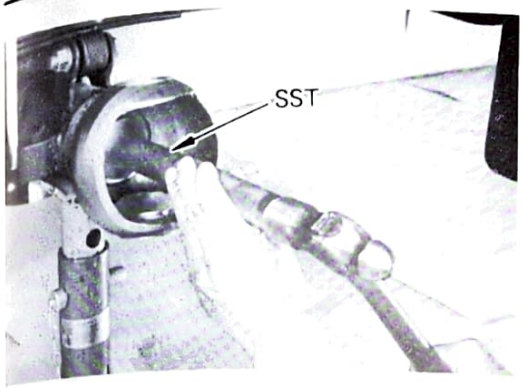
UPPER SHIM THICKNESS "F"

"F" = "C" – "E"

NOTE: Compare "E" and "F" with the thicknesses of the shims removed at disassembly. If there is considerable difference, remeasure "E" and "F".

Adjusting shim thickness

Part No.	Thickness mm (in.)
43236-60010	0.1 (0.004)
43233-60011	0.2 (0.008)
43234-60011	0.5 (0.020)
43235-60010	1.0 (0.039)



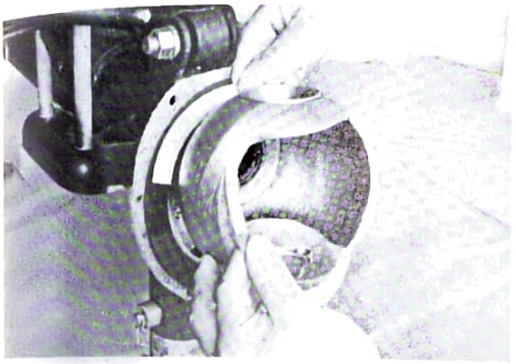
ASSEMBLY OF STEERING KNUCKLE AND AXLE SHAFT

(See illustration on page 13-40)

1. INSTALL OIL SEAL TO AXLE HOUSING

Using a seal driver*, drive the oil seal into the axle housing.

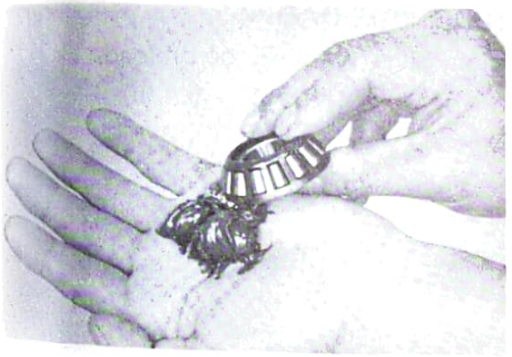
*SST 09618-60010 or Commercial driver



2. INSTALL OIL SEAL SET

Install the parts in the following order:

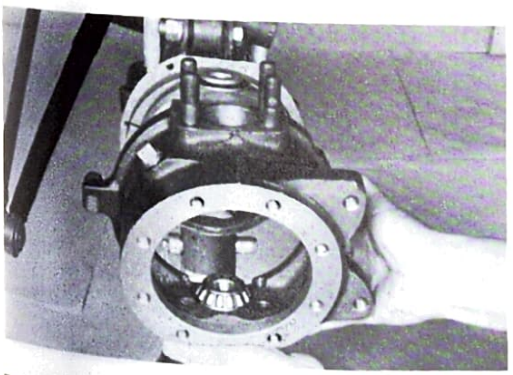
(a) Felt dust seal
(b) Rubber seal
(c) Steel ring



3. PACK BEARINGS WITH MOLYBDENUM DISUIPHIDE LITHIUM BASE GREASE

Place some grease in your hand and force grease into bearing until completely filled.

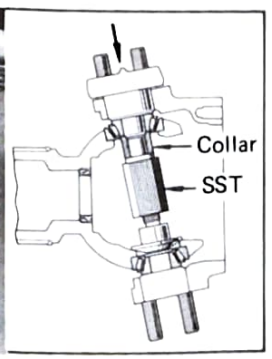
NOTE: If available, use a pressure bearing lubricator.



4. INSTALL STEERING KNUCKLE AND BEARINGS

(a) Place the bearings in positions on the knuckle and axle housing.

(b) Insert the knuckle on the axle housing.



5. INSTALL KNUCKLE ARM AND BEARING CAP

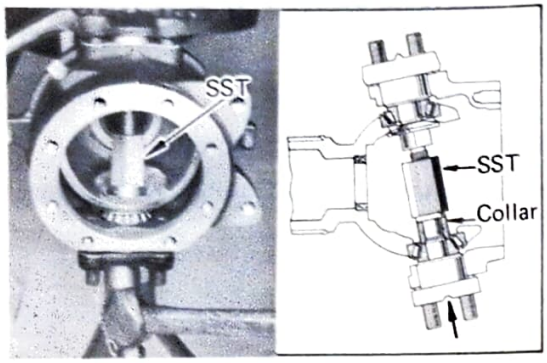
(a) Using SST*, support the upper bearing inner race.

*SST 09606-60020

NOTE: Use SST with a collar.

(b) Install the knuckle arm over the shims that were originally used or were selected as described in adjustment operations.

(c) Using a hammer, tap the knuckle arm into the bearing inner race.



(d) Using SST*, support the lower bearing inner race.

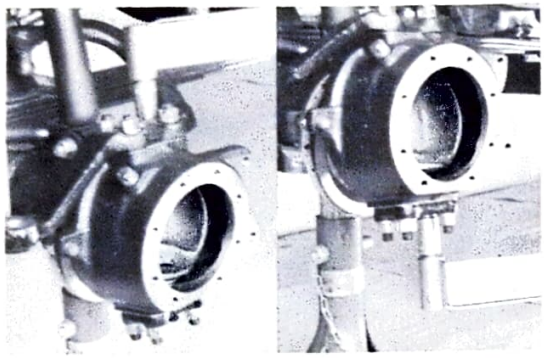
*SST 09606-60020

NOTE: Use SST with a collar.

(e) Install the bearing cap over the shims that were originally used or were selected as described in adjustment operations.

(f) Using a hammer, tap the bearing cap into the bearing inner race.

(g) Remove the SST from the knuckle.

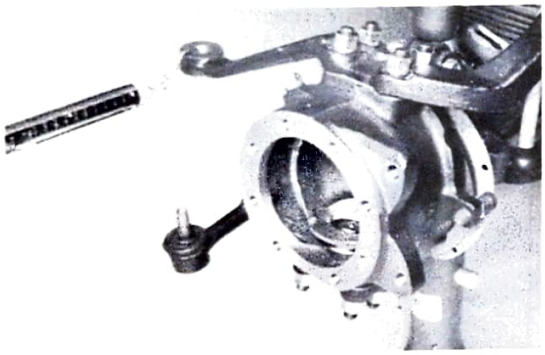


(h) Install the cone washers to the knuckle arm and tighten the nuts.

Torque: 8.5 – 11.0 kg-m (62 – 79 ft-lb)

(i) Install and tighten the bearing cap mounting nuts.

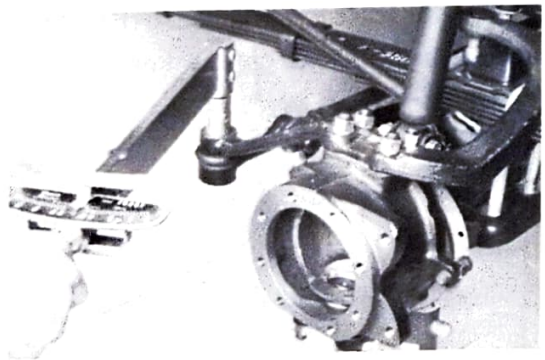
Torque: 8.5 – 11.0 kg-m (62 – 79 ft-lb)



6. MEASURE BEARING PRELOAD

Using a spring tension gauge, measure the preload.

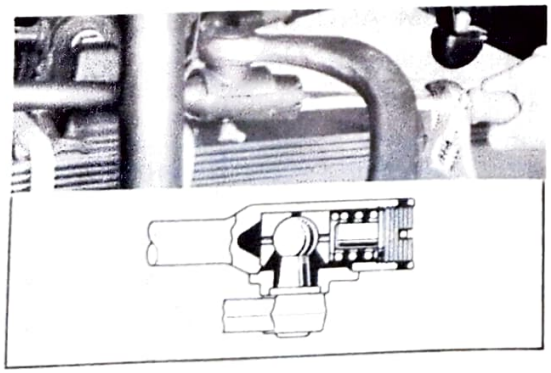
Preload (rotating): 1.8 – 3.8 kg (4.0 – 8.4 lb)



7. CONNECT TIE ROD TO KNUCKLE ARM

Tighten the castle nut and secure it with a cotter pin.

Torque: 7.5 – 11.0 kg-m (55 – 79 ft-lb)



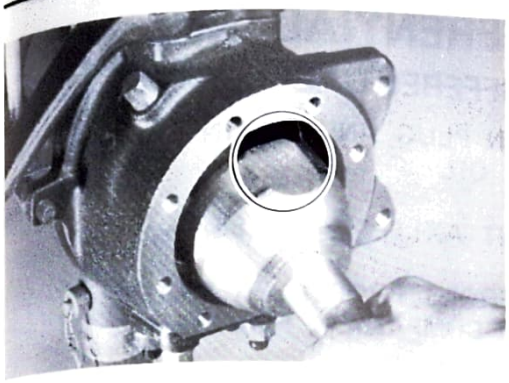
8. CONNECT DRAG LINK TO KNUCKLE ARM

(a) Insert the drag link on the knuckle arm.

(b) Install the ball stud seat, spring, spring seat and plug in the drag link end.

(c) Tighten the plug completely and then loosen 1-1/3 turns.

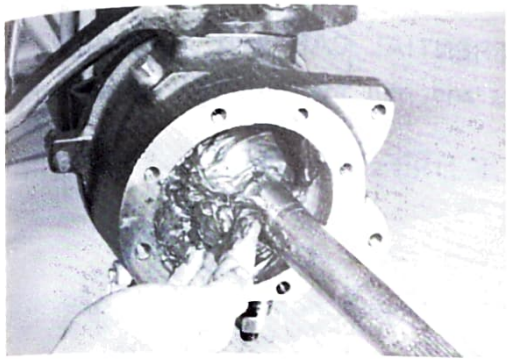
(d) Secure the plug with a cotter pin.



9. INSTALL OIL SEAL SET RETAINER TO KNUCKLE

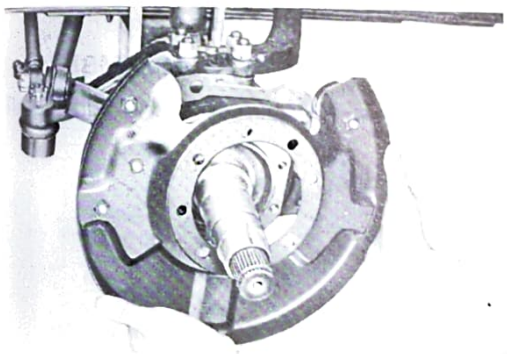
10. INSTALL AXLE SHAFT

Position one flat part of the outer shaft upward, and install the shaft.



11. PACK MOLIBDENUM DISULPHIDE LITHIUM BASE GREASE IN KNUCKLE

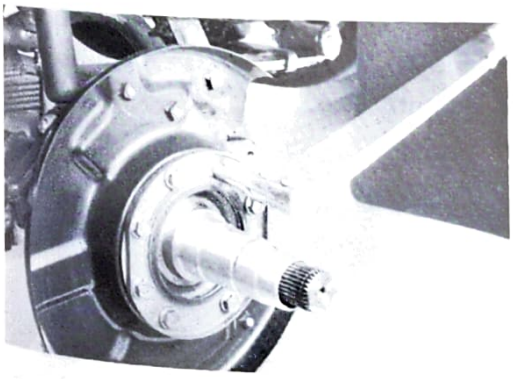
Pack molibdenum disulphide lithium base grease into the knuckle to about three fourths of the knuckle volume.



12. INSTALL KNUCKLE SPINDLE, DUST COVER AND DUST SEAL WITH NEW GASKETS

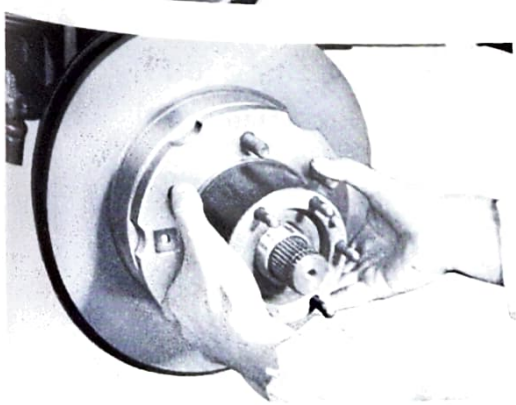
(a) Place the gasket in position on the knuckle and install the spindle.

(b) Place the dust cover, gasket and dust seal on the spindle.

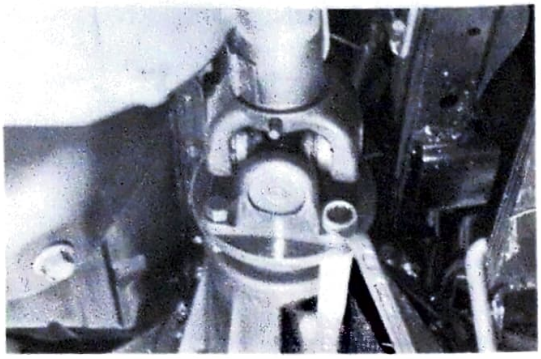


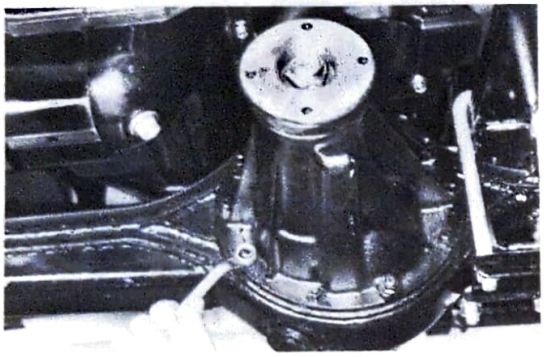
(c) Tighten the spindle mounting bolts.

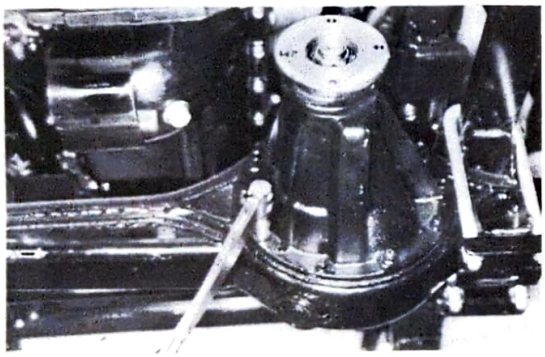
Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)

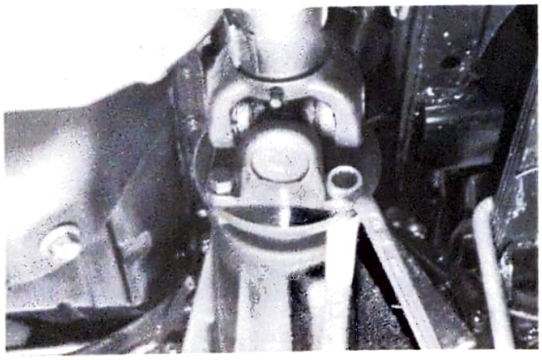


13. INSTALL AXLE HUB **(See page 13-38)**









FRONT DIFFERENTIAL (RN4×4)

REMOVAL OF DIFFERENTIAL

1. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL
2. REMOVE FRONT AXLE SHAFT (See page 13-40)
3. DISCONNECT FRONT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE

   Remove four bolts and nuts.
4. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

   Remove 10 nuts and pull out the differential carrier assembly.

DISASSEMBLY OF DIFFERENTIAL

(See page 14-13)

INSTALLATION OF DIFFERENTIAL

1. INSTALL DIFFERENTIAL CARRIER ASSEMBLY

   Install differential carrier assembly in the axle and install 10 nuts.

   Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)
2. CONNECT FRONT PROPELLER SHAFT FLANGE TO COMPANION FLANGE

   Torque four bolts and nuts.

   Torque: 3.0 – 5.0 kg-m (22 – 36 ft-lb)
3. INSTALL FRONT AXLE SHAFT (See page 13-51)
4. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

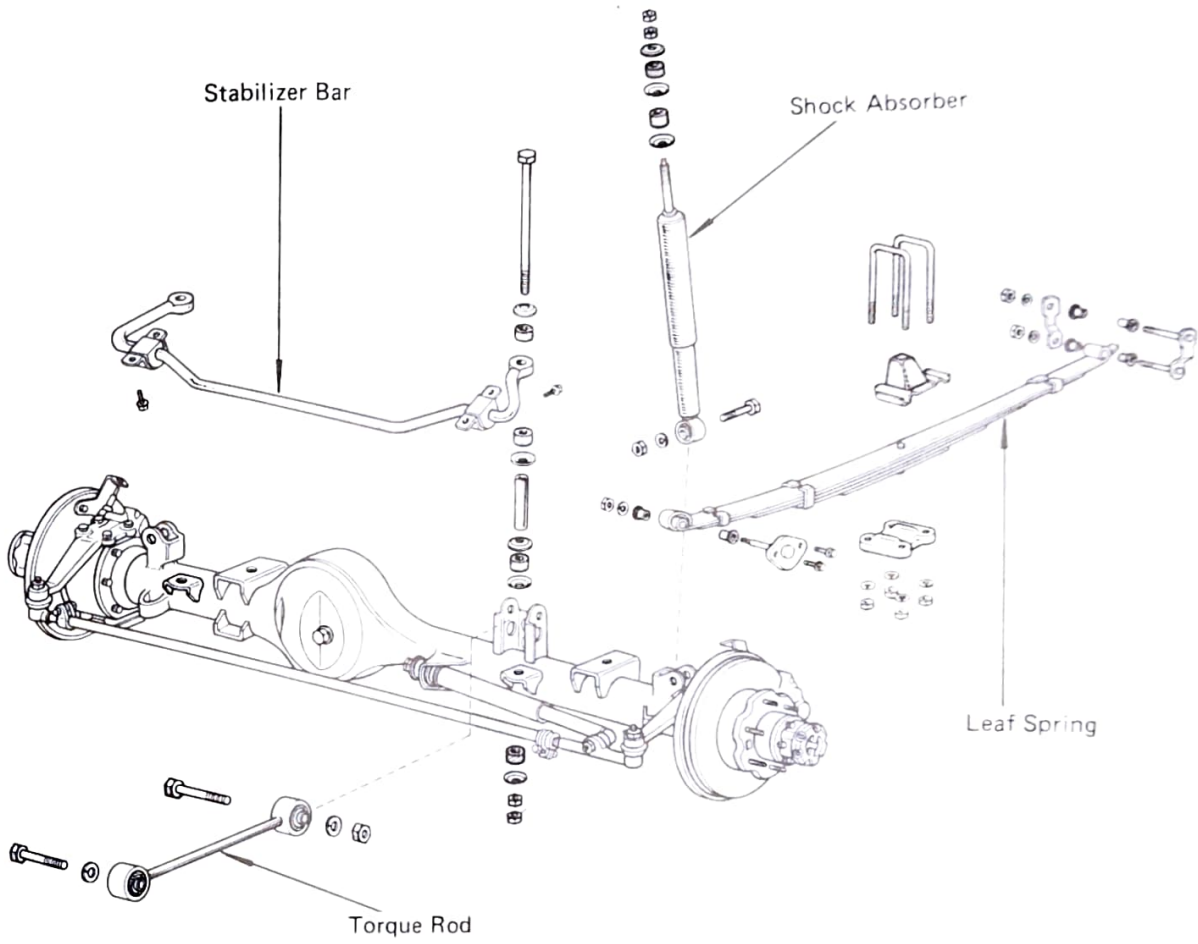
   Differential oil:

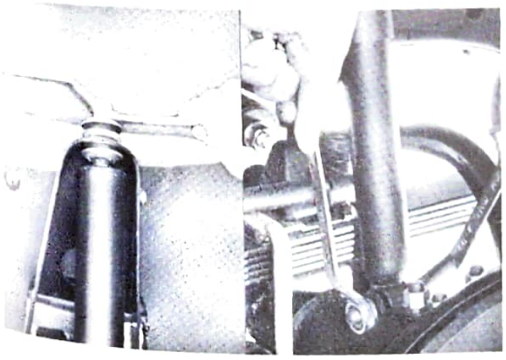
   API GL-5 hypoid gear oil
   SAE 90 above –18°C (0°F)
   SAE 80W or 80W-90 below –18°C (0°F)

   Capacity: 2.2 liters (2.3 US qts, 1.9 Imp. qts)

   Install a filler plug.

FRONT SUSPENSION (RN4×4)





Front Shock Absorber

REMOVAL OF FRONT SHOCK ABSORBER

1. DISCONNECT SHOCK ABSORBER FROM BRACKET

   Remove the two nuts holding shock absorber to the bracket.

2. DISCONNECT SHOCK ABSORBER FROM FRONT AXLE HOUSING

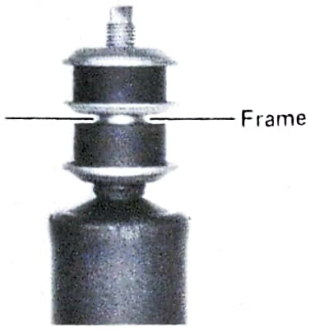
   Remove the bolt holding shock absorber to the front axle housing and remove the shock absorber.

INSPECTION OF FRONT SHOCK ABSORBER

INSPECT FRONT SHOCK ABSORBER

(a) Inspect the front shock absorber component parts for wear, damage or oil leaks.

(b) Inspect the front shock absorber operation.

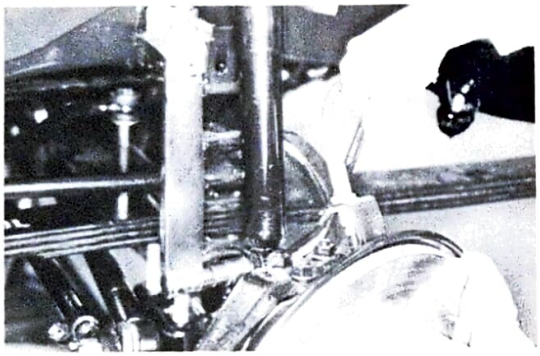


INSTALLATION OF FRONT SHOCK ABSORBER (See illustration on page 13-53)

1. CONNECT SHOCK ABSORBER TO BRACKET

   Connect the shock absorber to the bracket with two nuts.
   Tighten the nuts.

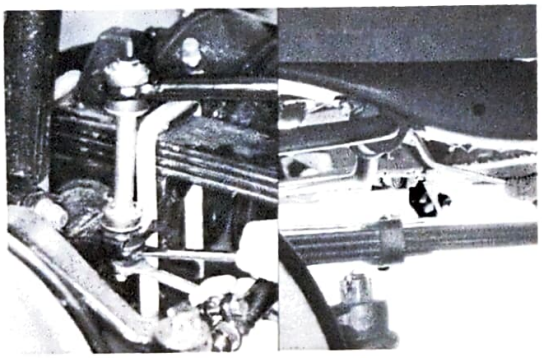
   Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)



2. CONNECT SHOCK ABSORBER TO FRONT AXLE HOUSING

   Connect the shock absorber to the front axle housing with the bolt and nut.
   Tighten the bolt and nut.

   Torque: 3.5 – 5.5 kg-m (26 – 39 ft-lb)



Stabilizer Bar

REMOVAL OF STABLIZER BAR (See illustration on page 13-53)

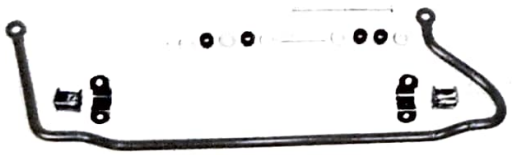
1. DISCONNECT STABILIZER BAR FROM FRONT AXLE HOUSING

   Remove the nuts, cushions and bolts holding both sides of the stabilizer bar to axle housing.

2. DISCONNECT STABILIZER BAR FROM FRAME

   Remove both stabilizer bar brackets from the frame, and remove the stabilizer bar.

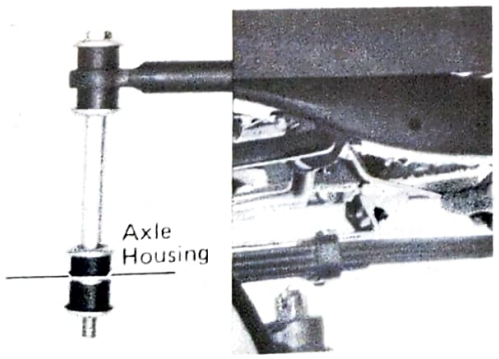
INSPECTION OF STABILIZER BAR



INSPECT STABILIZER BAR

Inspect the stabilizer bar component parts for wear or damage.

INSTALLATION OF STABILIZER BAR (See illustration on page 13-53)



1. INSTALL STABILIZER BAR TO FRAME

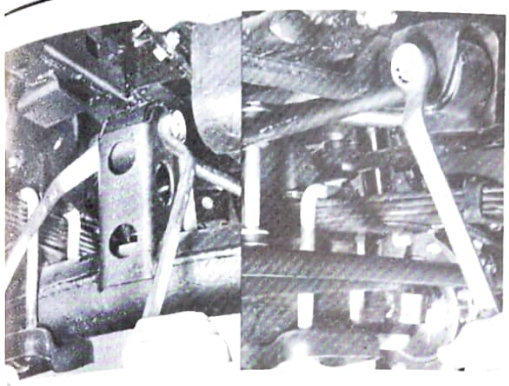
   Place the stabilizer bar in position and install both stabilizer bushings and brackets to the frame.

   Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

2. CONNECT STABILIZER BAR TO AXLE HOUSING

   Connect the stabilizer bar on both sides to the axle housing with bolts, cushions and nuts as shown.

   Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)



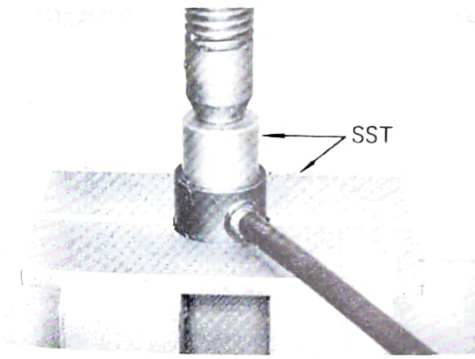
Torque Rod

REMOVAL OF TORQUE ROD
(See illustration on page 13-53)

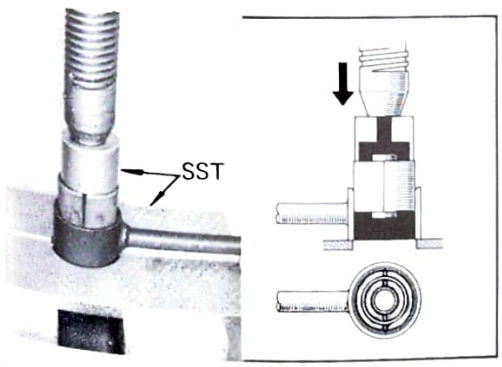
1. DISCONNECT TORQUE ROD FROM AXLE HOUSING
2. DISCONNECT TORQUE ROD FROM FRAME

INSPECTION OF TORQUE ROD

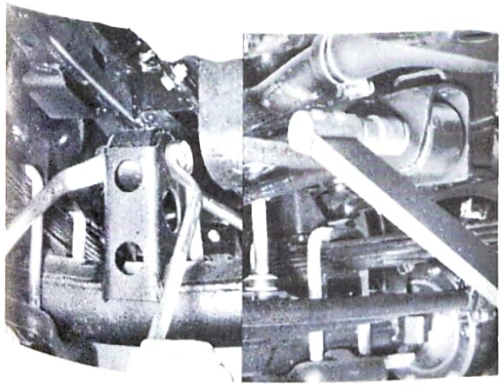
1. INSPECT TORQUE ROD
   (a) Inspect the torque rod for damage.
   (b) Inspect the bushings for wear or damage.
   If the bushings are worn or damaged, replace them.



2. IF NECESSARY REPLACE BUSHING
   (a) Using a press and collar*, remove the bushing.
   *SST 09726-35010 and 09527-10010 or Commercial collar

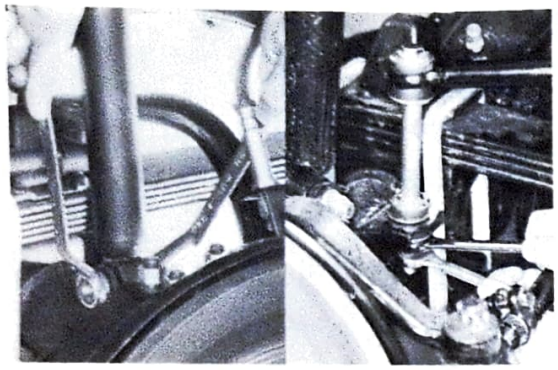


   (b) Using a press and collar*, install the new bushing.
   *SST 09726-35010 and 09527-10010 or Commercial collar
   NOTE: Position the bushing holes at right angle to the rod. Press in the bushing from the beveled end.



INSTALLATION OF TORQUE ROD
(See illustration on page 13-53)

1. INSTALL TORQUE ROD
   Finger tighten the mounting bolts.
2. BOUNCE VEHICLE TO STABILIZE BUSHINGS
3. TIGHTEN TORQUE ROD MOUNTING BOLTS
   Torque: 12.0 – 17.0 kg-m (87 – 122 ft-lb)



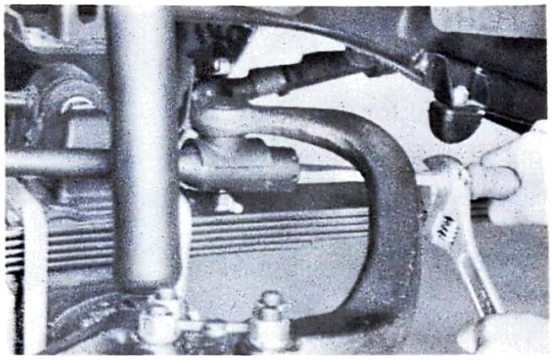
Leaf Spring

REMOVAL OF LEAF SPRING

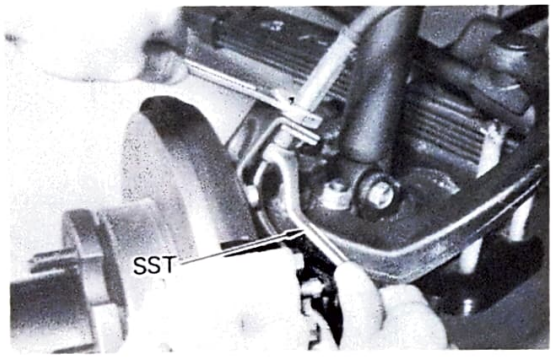
(See illustration on page 13-53)

1. DISCONNECT SHOCK ABSORBER FROM AXLE HOUSING

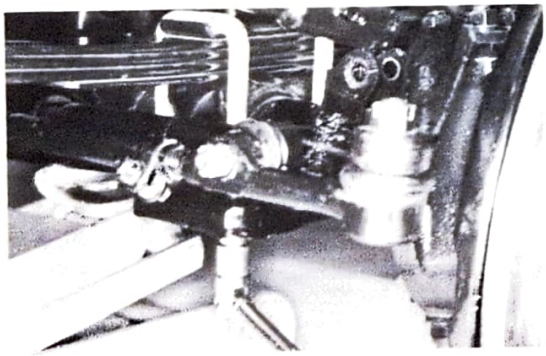
2. DISCONNECT STABILIZER BAR FROM AXLE HOUSING



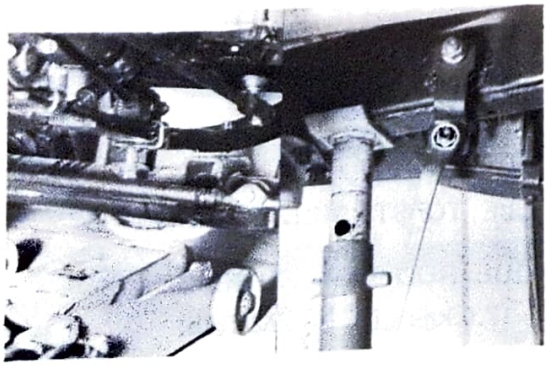
3. DISCONNECT DRAG LINK FROM KNUCKLE ARM
   (a) Remove the cotter pin from the drag link end.
   (b) Using a screwdriver, remove the plug.
   (c) Disconnect the drag link from the knuckle arm.



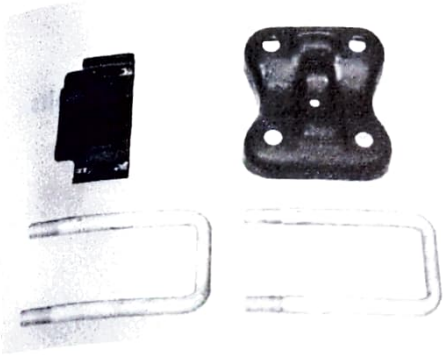
4. DISCONNECT BRAKE HOSE FROM BRAKE DUST COVER
   (a) Using a flare nut wrench*, disconnect the brake tube.
   *SST 09751-36011 or Commercial wrench
   (b) Remove the clip and disconnect the hose from the dust cover.



5. REMOVE U-BOLTS
   (a) Using a jack, support the axle housing.
   (b) Remove the U-bolts, spring seat and spring bumper from the leaf spring.



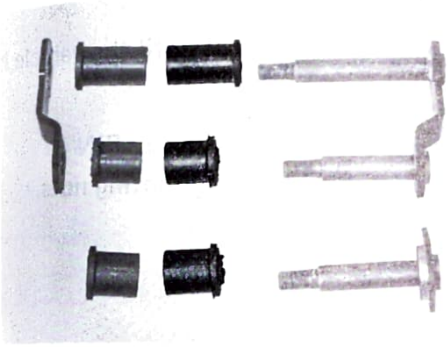
6. REMOVE LEAF SPRING
   (a) Lower the axle housing and free the leaf spring.
   (b) Remove the shackle pin and hanger pin from the leaf spring.
   (c) Remove the leaf spring.



INSPECTION OF LEAF SPRING

1. INSPECT U-BOLTS, SPRING SEAT AND SPRING BUMPER

Inspect the parts for wear or damage.

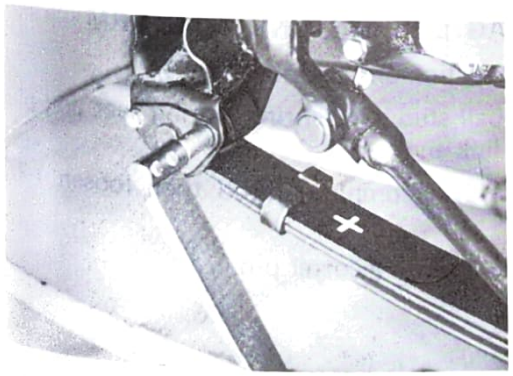


2. INSPECT SHACKLE PIN, HANGER PIN AND BUSHINGS

Inspect the parts for wear or damage.

3. INSPECT LEAF SPRING

Inspect the leaf spring for weakness or damage.



INSTALLATION OF LEAF SPRING
(See illustration on page 13-53)

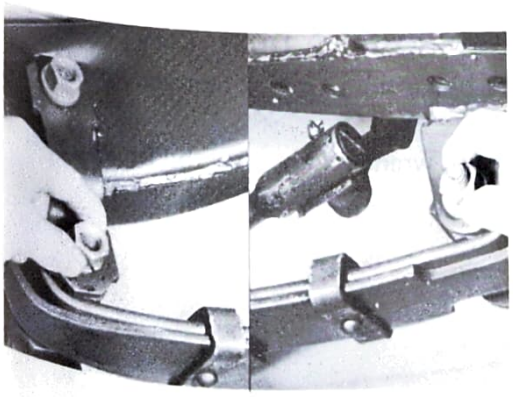
1. INSTALL LEAF SPRING

(a) Insert the bushings into the frame and into both ends of the leaf spring.

(b) Place the leaf spring in position.

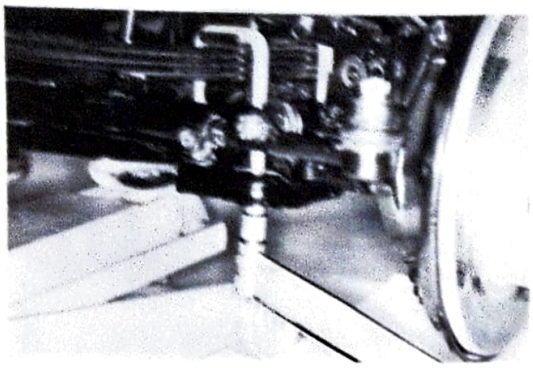
(c) Install the hanger pin and tighten the bolts.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

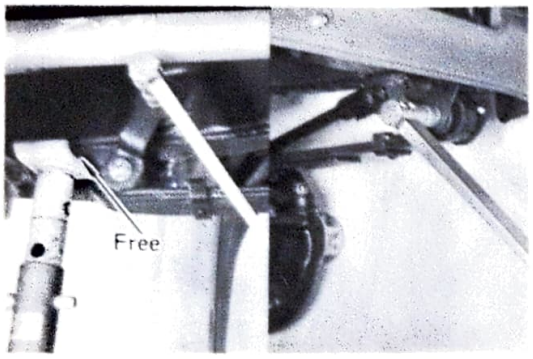


(d) Finger tighten the hanger pin mounting nut.

(e) Install the shackle pin and finger tighten the nuts.

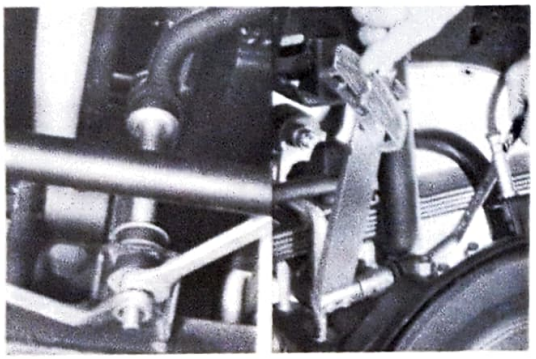


2. INSTALL U-BOLTS
   (a) Support the axle housing with a jack.
   (b) Install the spring bumper, spring seat and U-bolts.
   (c) Tighten the U-bolt mounting nuts.
   Torque: 10.0 – 15.0 kg-m (73 – 108 ft-lb)



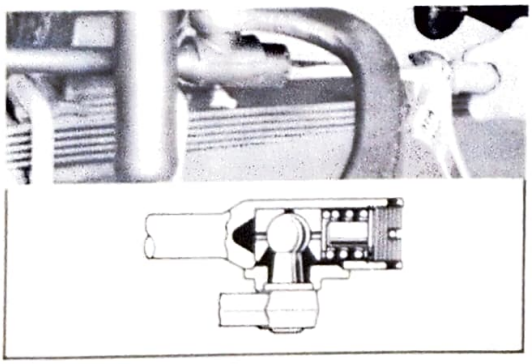
3. RAISE FRONT AXLE HOUSING
   Raise the front axle housing with a jack until the vehicle is free from the stands.

4. TIGHTEN HANGER PIN AND SHACKLE PIN
   Tighten the hanger pin and shackle pin mounting nuts.
   Torque: 7.5 – 11.0 kg-m (55 – 79 ft-lb)

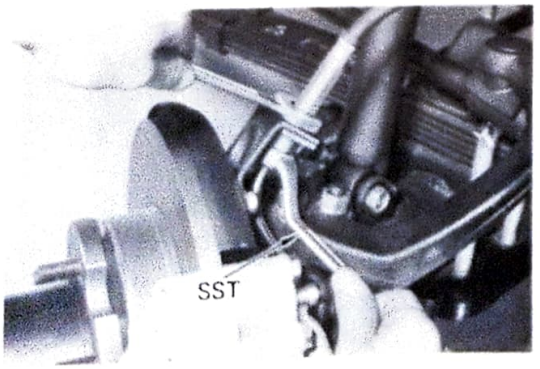


5. CONNECT STABILIZER BAR TO AXLE HOUSING
   Tighten the mounting nuts.
   Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)

6. CONNECT SHOCK ABSORBER TO AXLE HOUSING
   Tighten the mounting bolt.
   Torque: 3.5 – 5.5 kg-m (26 – 39 ft-lb)



7. CONNECT DRAG LINK TO KNUCKLE ARM
   (a) Insert the drag link on the knuckle arm.
   (b) Install the ball stud seat, spring, spring seat and plug in the drag link end.
   (c) Tighten the plug completely and then loosen 1-1/3 turns.
   (d) Secure the plug with a cotter pin.



8. CONNECT BRAKE HOSE TO DUST COVER
   (a) Connect the brake hose to the dust cover with the clip.
   (b) Using a flare nut wrench*, connect the brake tube.
   *SST 09751-36011 or Commercial wrench

REAR AXLE AND SUSPENSION

	Page
TROUBLESHOOTING	14-2
SPECIAL TOOLS AND TEST EQUIPMENT	14-2
REAR AXLE SHAFT	14-3
DIFFERENTIAL	14-9
REAR SUSPENSION	14-28
Rear Shock Absorber	14-28
Leaf Spring	14-29

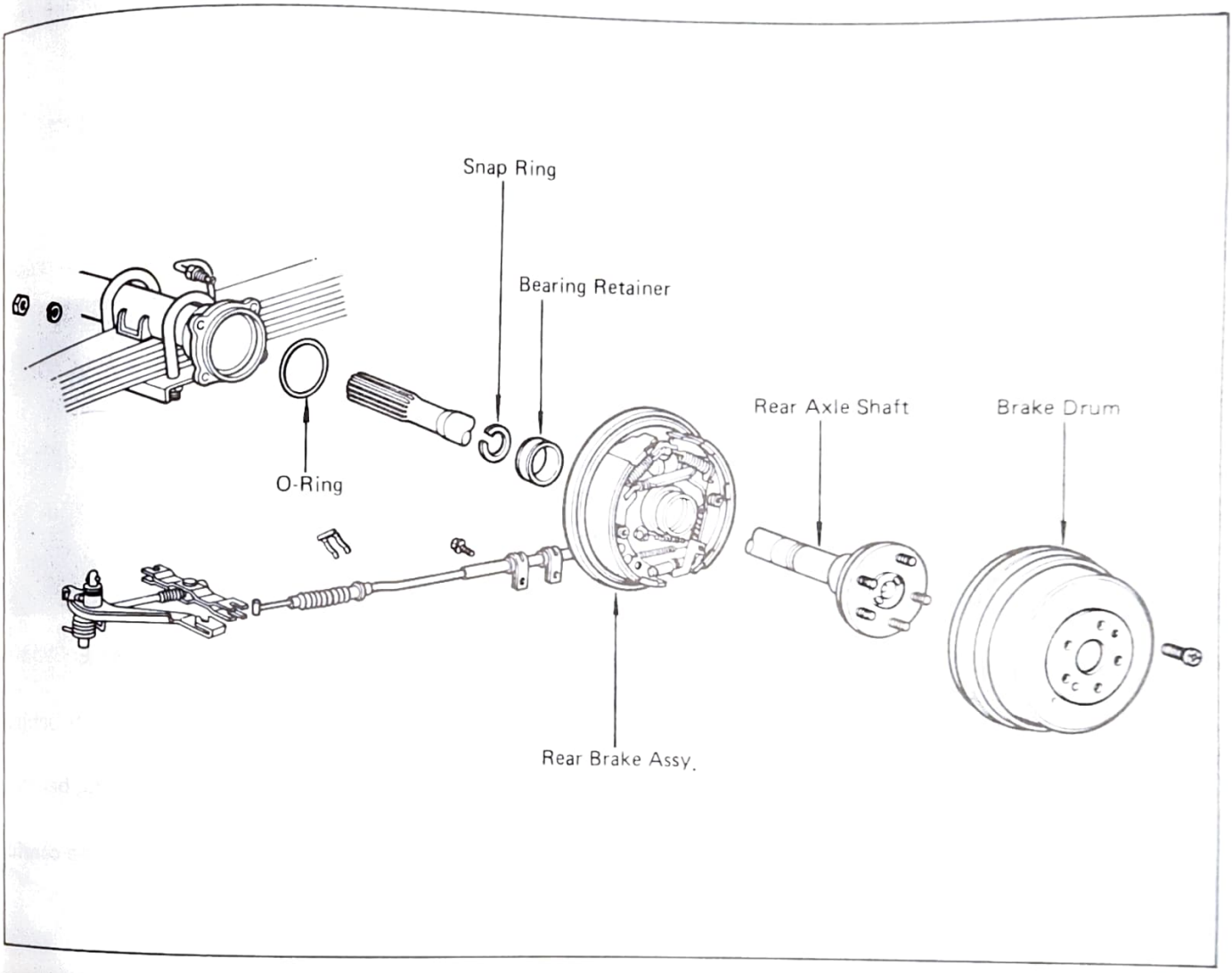
TROUBLESHOOTING

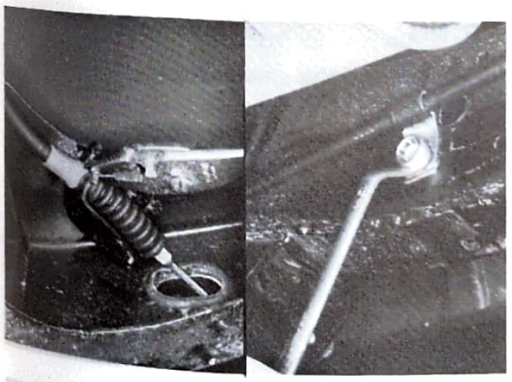
Problem	Possible cause	Remedy	Page
Oil leak at rear axle	Oil seals damaged or worn	Replace oil seal	14-7
	Bearing retainer loose	Replace retainer	14-4
	Rear axle housing cracked	Repair as necessary	
Oil leak at pinion shaft	Oil level too high or wrong grade	Drain and replace oil	2-11
	Oil seal worn or damaged	Replace oil seal	14-9
	Companion flange loose or damaged	Tighten or replace flange	14-9
Noises in rear axle	Oil level low or wrong grade	Drain and replace oil	2-11
	Excessive backlash between pinion and ring or side gear	Check backlash	14-13
	Ring, pinion or side gears worn or chipped	Inspect gears	14-15
	Pinion shaft bearing worn	Replace bearing	14-15
	Axle shaft bearing worn	Replace bearing	14-3
	Differential bearing loose or worn	Tighten or replace bearings	14-17

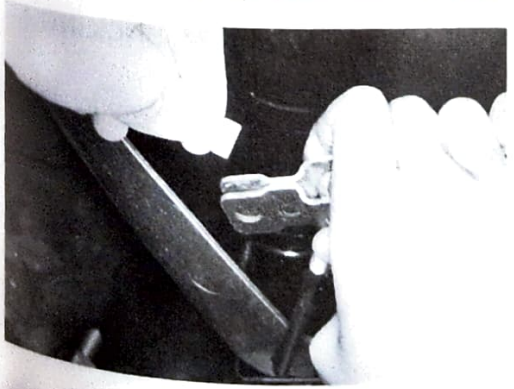
SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Flare nut wrench	09751-36011 or Commercial	To loosen or tighten brake line
Snap ring pliers	09905-00012 or Commercial	To remove snap ring
Rear axle shaft puller	09521-25011	To remove rear axle shaft
Oil seal puller	09308-00010 or Commercial	To remove rear axle shaft outer and inner oil seals
Bearing driver	09608-30011 or Commercial	To install rear axle shaft outer and inner oil seals To remove rear axle shaft bearing To install drive pinion bearing races
Bearing collar	09228-44010 or Commercial	To install rear axle shaft outer oil seal To remove rear axle shaft bearing
	09608-35012 or Commercial	To install rear axle shaft bearing
Bearing collar	09515-30010 or Commercial	To install rear axle shaft
Companion flange holder	09330-00020 or Commercial	To remove and install companion flange
Companion flange remover	09557-22022	To remove companion flange
Oil seal puller	09308-10010 or Commercial	To remove drive pinion oil seal
Bearing puller	09556-22010 or 00001-00008-02	To remove drive pinion front bearing
Oil seal driver	09554-30011 or Commercial	To install drive pinion oil seal
Universal puller	09950-20014	To remove drive pinion rear bearing
Bearing collar	09506-30011 or Commercial	To install drive pinion rear bearing
Drive pinion adjusting gauge	09530-30012 and 09536-30030	To adjust drive pinion protrusion (RN 1/2 ton and RN 3/4 ton)
Drive pinion adjusting gauge	09530-30012 and 09536-26010	To adjust drive pinion protrusion (RN C&C and RN 4x4)
Side bearing adjusting nut wrench	09504-00010 or Commercial	To install side bearing adjusting nuts

REAR AXLE SHAFT

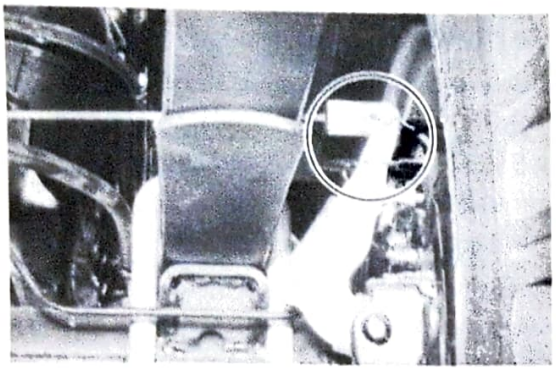






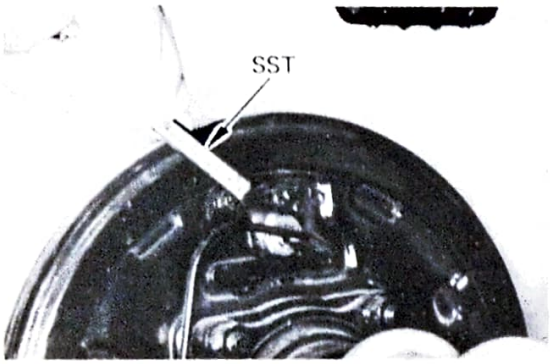
REMOVAL OF REAR AXLE SHAFT

1. DISCONNECT PARKING BRAKE REAR CABLE (RN 4 x 2)
   (a) Remove the clip and clamp bolt from the frame.
   (b) Disconnect the parking brake rear cable from the equalizer.



(RN 4 x 4)

Remove the pin and disconnect the parking brake rear cable from the bell crank.



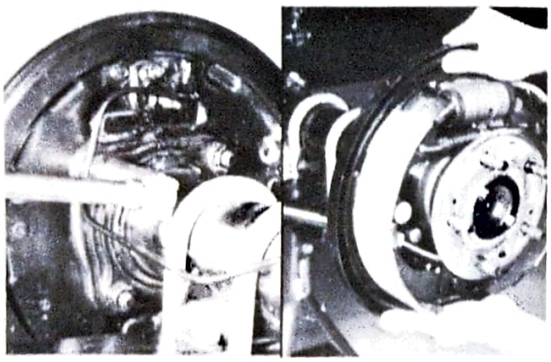
2. **REMOVE WHEEL AND BRAKE DRUM**

3. **REMOVE DRAIN PLUG AND DIFFERENTIAL OIL**

4. **DISCONNECT BRAKE TUBE**

Using a flare nut wrench*, disconnect the brake tube.

*SST 09751-36011 or Commercial wrench

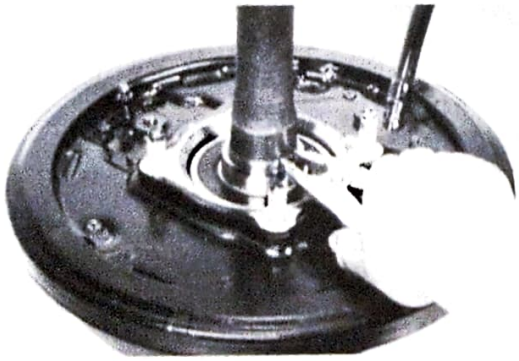


5. **REMOVE REAR AXLE SHAFT FROM AXLE HOUSING**

(a) Remove the four backing plate mounting nuts behind the backing plate.

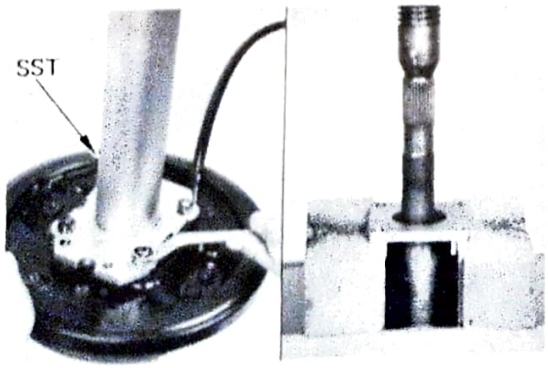
(b) Pull out the rear axle shaft together with the backing plate.

CAUTION: When pulling out the rear axle shaft, be careful not to damage the oil seal.



6. **REMOVE SNAP RING**

Using snap ring pliers, remove the snap ring.



7. **REMOVE REAR AXLE SHAFT FROM BACKING PLATE**

(a) Attach a rear axle shaft puller* to the backing plate.

*SST 09521-25011

(b) Press out the rear axle shaft from the backing plate.

INSPECTION OF REAR AXLE SHAFT COMPONENTS

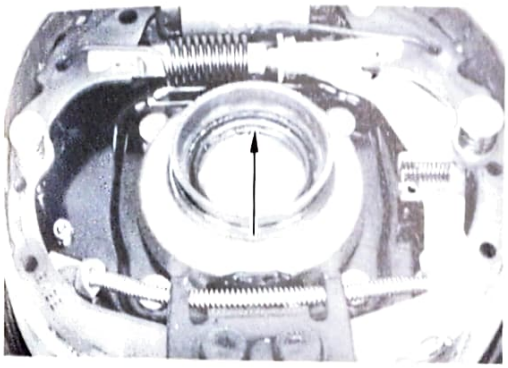
1. INSPECT REAR AXLE SHAFT AND FLANGE

(a) Check for wear or damage.

(b) Using a dial indicator, check the shaft and flange runout.

Maximum shaft runout: 2.0 mm (0.079 in.)

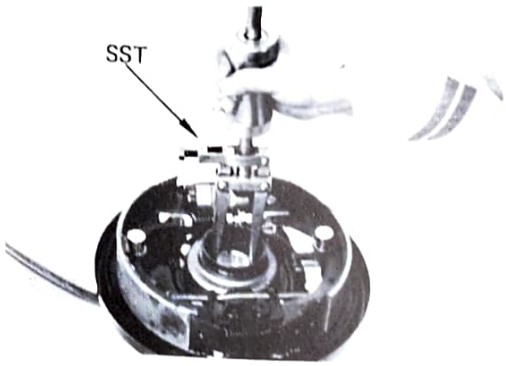
Maximum flange runout: 0.2 mm (0.008 in.)



2. INSPECT OUTER OIL SEAL

Check for wear or damage.

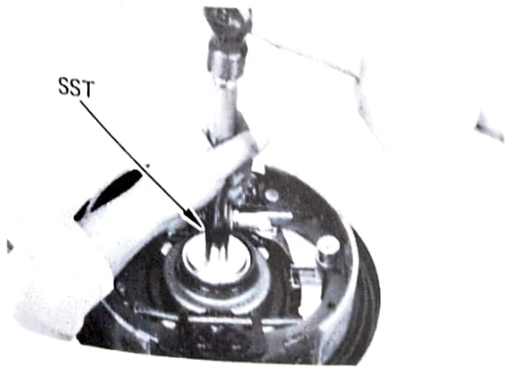
If the seal is worn or damaged, replace it.



3. IF NECESSARY, REPLACE OUTER OIL SEAL

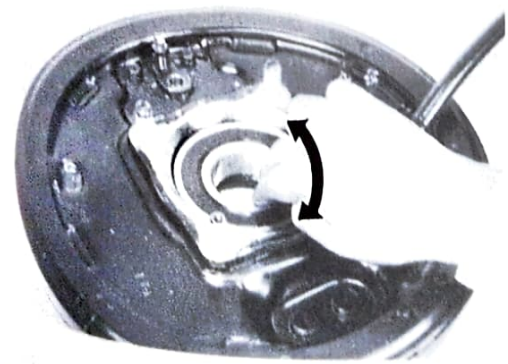
(a) Using a puller*, remove the oil seal.

*SST 09308-00010 or Commercial puller



(b) Using a driver*, drive in the new oil seal.

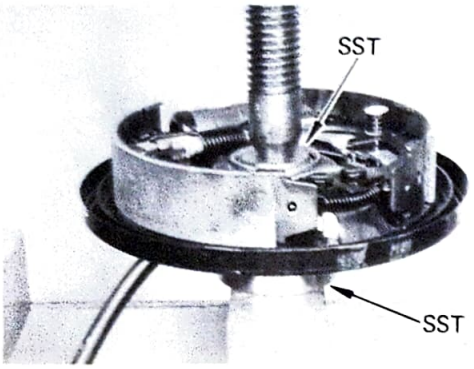
*SST 09608-30011 or Commercial driver



4. INSPECT REAR AXLE BEARING

Check for wear or damage.

If the bearing is worn or damaged, replace it.

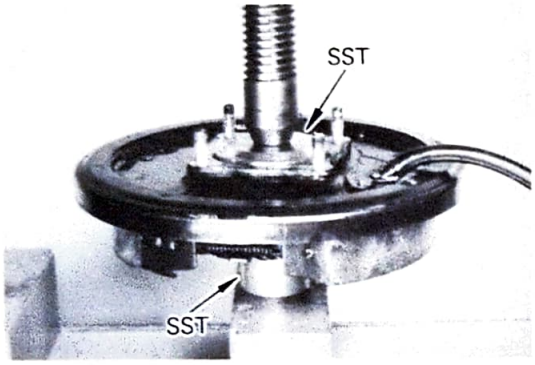


5. IF NECESSARY, REPLACE REAR AXLE BEARING

(a) Remove the bearing oil seal.

(b) Using a driver and collar*, press out the bearing.

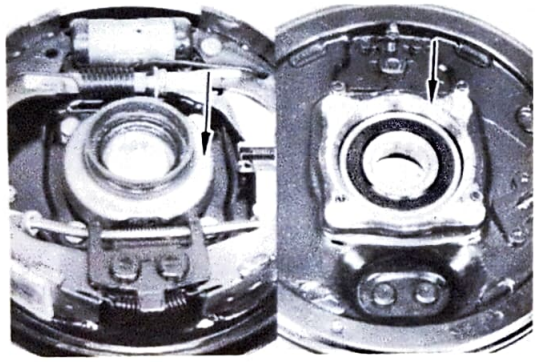
*SST 09608-30011 and 09228-44010, or Commercial driver and collar



(c) Using a driver and collar*, press in the new bearing.

*SST 09608-35012 and 09515-30010, or Commercial driver and collar

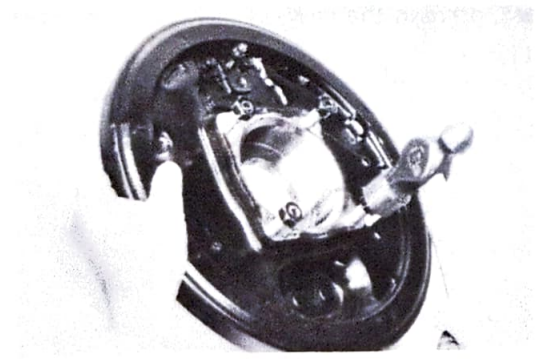
(d) Install the new oil seal. (See page 14-5)



6. INSPECT BEARING CASE

Check for damage or cracks.

If the bearing case is damaged or cracked, replace it.

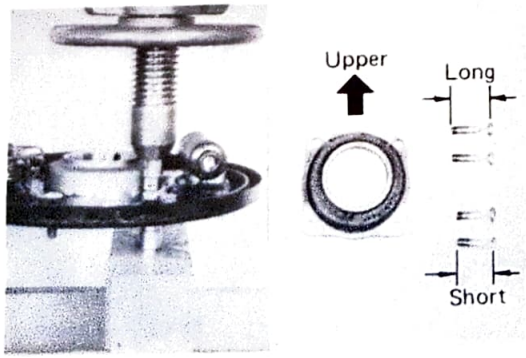


7. IF NECESSARY, REPLACE BEARING CASE

(a) Remove the oil seal and bearing. (See page 14-5)

(b) Install nuts to the serration bolts.

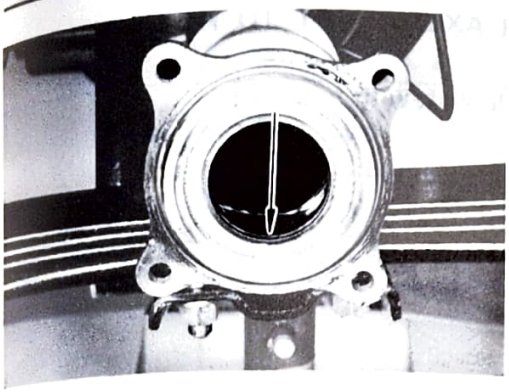
(c) Using a hammer, tap out the serration bolts and remove the bearing case.



(d) Position the backing plate on the new bearing case and, using two sockets, press in the serration bolts.

NOTE: Position the flat side of the bearing case and the two long serration bolts at the upper side of the bearing case.

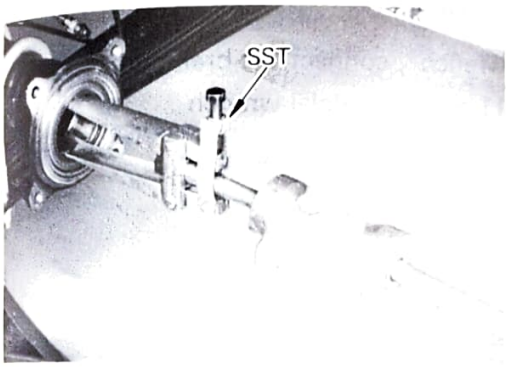
(e) Install the new bearing and oil seal. (See page 14-5)



8. INSPECT INNER OIL SEAL

Check for wear or damage.

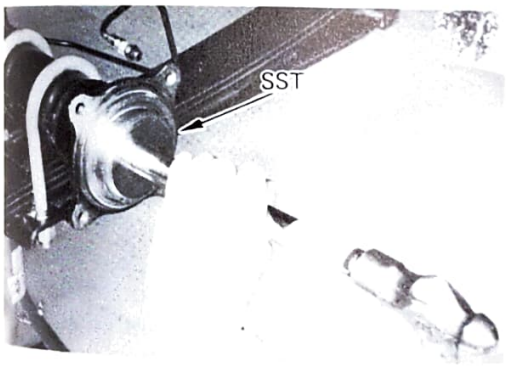
If the seal is worn or damaged, replace it.



9. IF NECESSARY, REPLACE INNER OIL SEAL

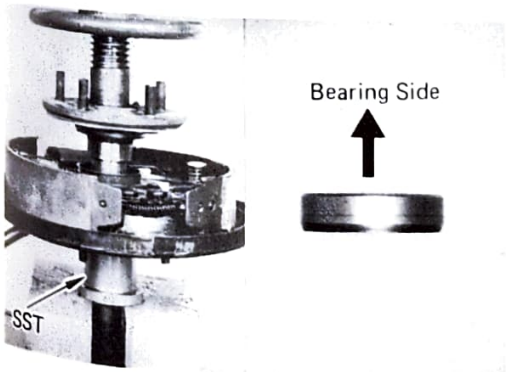
(a) Using a puller*, remove the oil seal.

*SST 09308-00010 or Commercial puller



(b) Using a driver*, drive in the new oil seal.

*SST 09608-30011 or Commercial driver



INSTALLATION OF REAR AXLE SHAFT (See illustration on page 14-3)

1. INSTALL REAR AXLE SHAFT IN BACKING PLATE

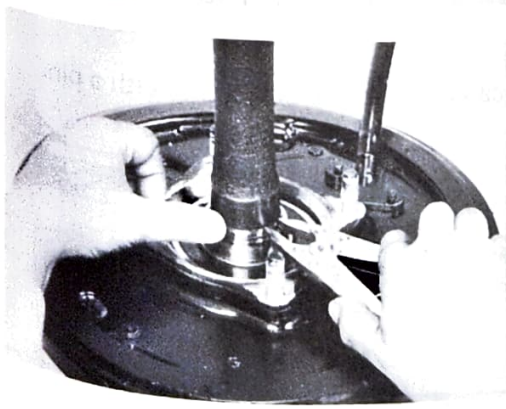
(a) Apply multipurpose grease on the oil seal.

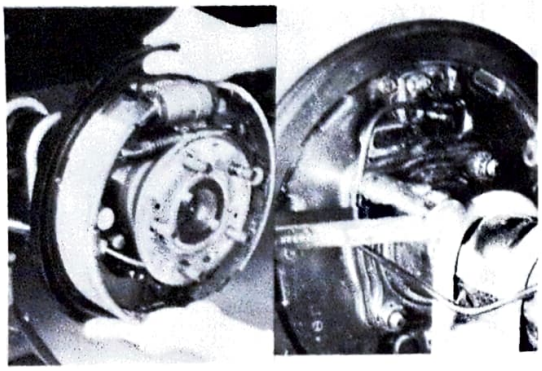
(b) Insert the backing plate and bearing retainer on the rear axle shaft.

(c) Using a collar*, press the rear axle shaft in the backing plate.

*SST 09515-30010 or Commercial collar

(d) Using snap ring pliers, install the snap ring.

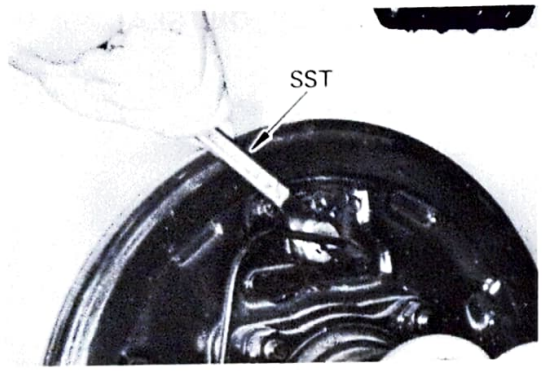




2. INSTALL REAR AXLE SHAFT TO REAR AXLE HOUSING

Install the rear axle shaft with four nuts.
Torque the nuts.

Torque: 6.0 – 8.0 kg-m (44 – 57 ft-lb)

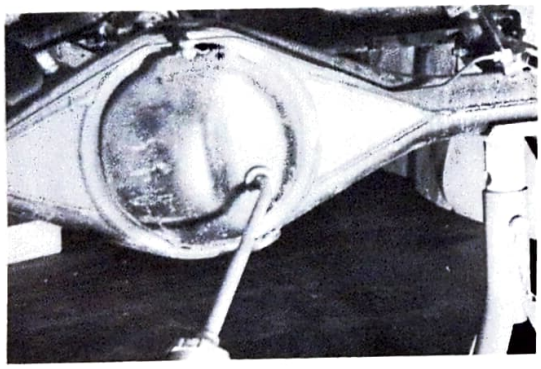


3. CONNECT BRAKE TUBE

Using a flare nut wrench*, connect the brake tube.

*SST 09751-36011 or Commercial wrench

4. INSTALL BRAKE DRUM AND WHEEL



5. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

Differential oil:

API GL-5 hypoid gear oil
SAE 90 above –18°C (0°F)
SAE 80W or 80W-90 below –18°C (0°F)

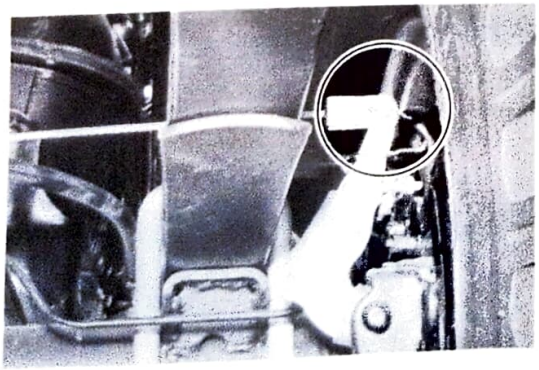
Capacity:

RN 1/2 ton and 3/4 ton	**1.7 liters (1.8 US qts, 1.5 Imp.qts)**
RN C&C	**1.8 liters (1.9 US qts, 1.6 Imp.qts)**
RN 4x4	**2.2 liters (2.3 US qts, 1.9 Imp.qts)**

6. CONNECT PARKING BRAKE REAR CABLE (RN 4 x 2)

(a) Connect the rear cable end to the equalizer.

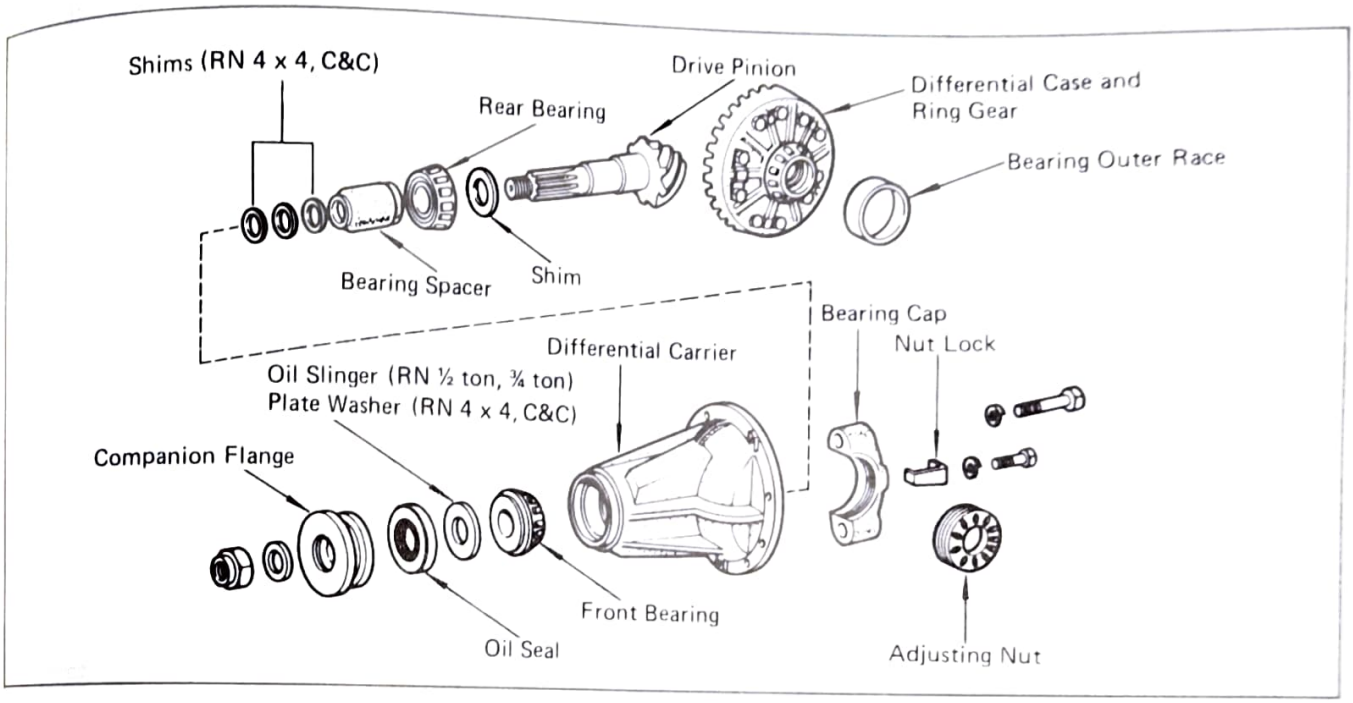
(b) Install the clip and clamp bolt to the frame.

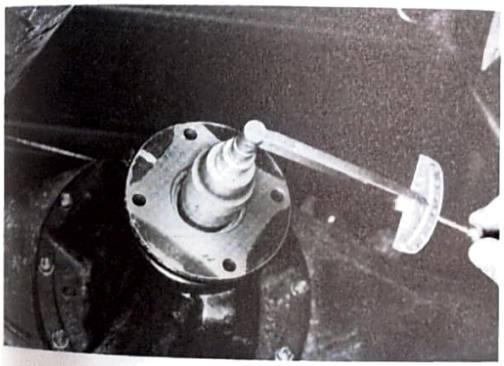


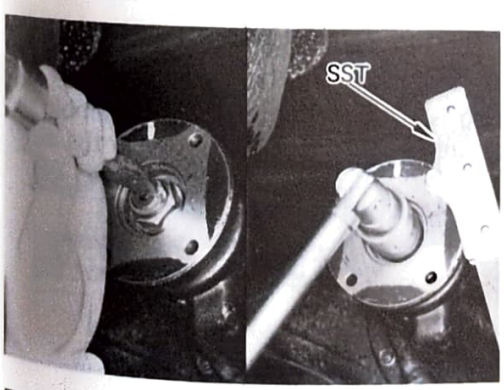
(RN 4 x 4)

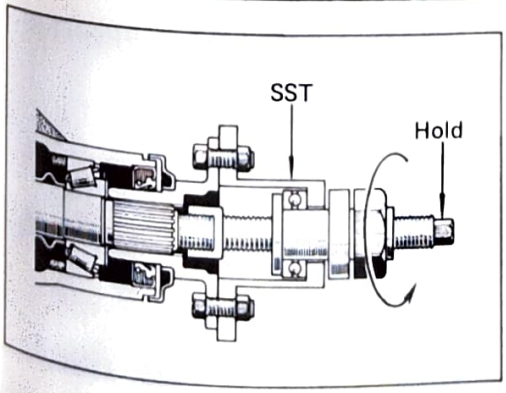
Connect the rear cable end to the bell crank with a pin.

DIFFERENTIAL









ON-VEHICLE REPLACEMENT OF OIL SEAL

1. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE (See page 12–3)

2. MEASURE DRIVE PINION PRELOAD (RN C&C and RN 4 x 4)

   Slowly turning the torque meter, measure the preload within the backlash of the drive pinion gear and the ring gear.

   Drive pinion preload: 9 – 13 kg-cm (7.8 – 11.3 in-lb)

   NOTE: If the preload is not within limits, adjust with shim before assembling the new oil seal.

3. REMOVE COMPANION FLANGE

   (a) Using a hammer and chisel, loosen the staked part of the nut.

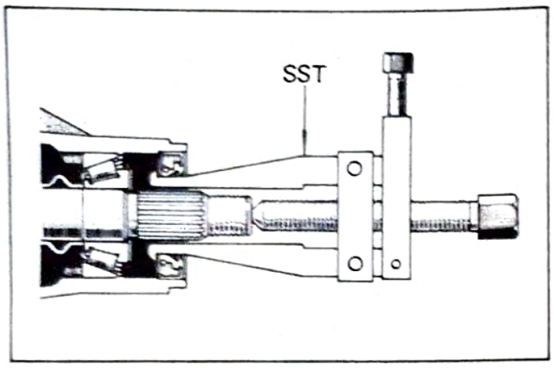
   (b) Using a holder* to hold the flange, remove the nut.

   *SST 09330-00020 or Commercial holder

   (c) Using a hammer, tap the companion flange off the shaft.

   NOTE: If a flange remover* is available, remove the companion flange with it.

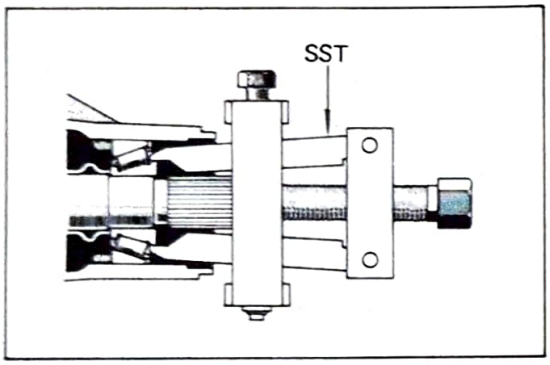
   *SST 09557-22022



4. REMOVE OIL SEAL

Using a puller*, remove the oil seal from the housing.

*SST 09308-10010 or Commercial puller



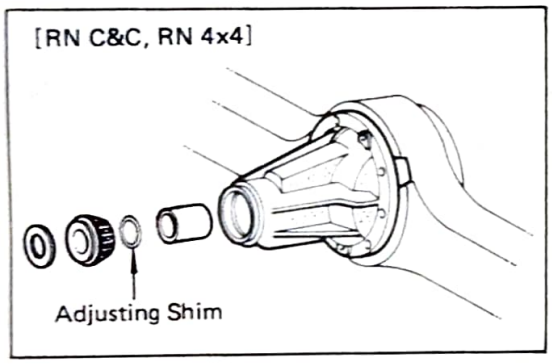
5. REMOVE FRONT BEARING AND BEARING SPACER (RN 1/2 ton and 3/4 ton)

(a) Remove the oil slinger.

(b) Using a puller*, remove the front bearing from the housing.

*SST 09556-22010 or 00001-00008-02

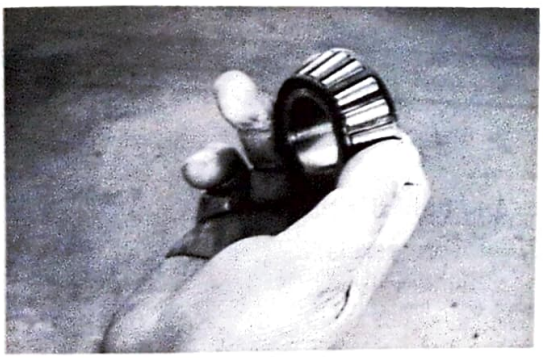
(c) Remove the bearing spacer.



6. IF DRIVE PINION PRELOAD IS INCORRECT, REMOVE FRONT BEARING AND BEARING SPACER (RN C&C and RN 4 x 4)

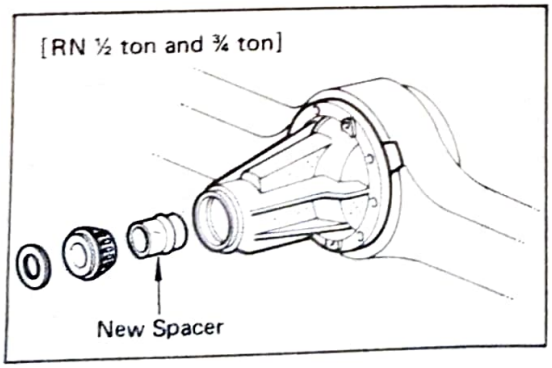
Remove the following parts:

(a) Plate washer
(b) Front bearing
(c) Shims
(d) Bearing spacer



7. INSPECT FRONT BEARING FOR WEAR OR DAMAGE

If the front bearing is damaged or worn, disassemble the differencial carrier and replace the bearing with the outer race as a set.

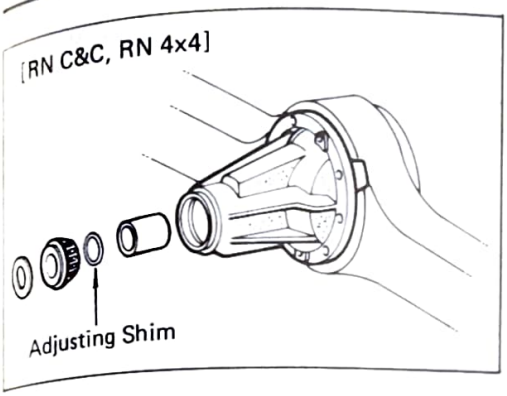


8. INSTALL NEW BEARING SPACER AND FRONT BEARING (RN 1/2 ton and 3/4 ton)

(a) Install a new bearing spacer on the shaft.

(b) Install the front bearing on the shaft.

(c) Install the oil slinger.



Shim thickness

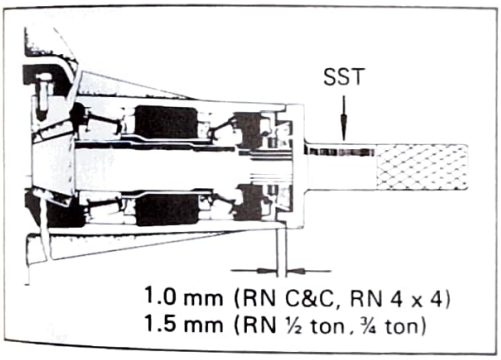
Part No.	No.	Thickness mm (in.)
90564-30035	1	0.23 – 0.27 (0.0091 – 0.0106)
90564-30193	2	0.28 – 0.32 (0.0110 – 0.0126)
90564-30194	3	0.33 – 0.37 (0.0130 – 0.0146)
90564-30195	4	0.38 – 0.42 (0.0150 – 0.0165)
90564-30063	5	0.43 – 0.47 (0.0169 – 0.0185)

9. INSTALL BEARING SPACER AND FRONT BEARING (RN C&C and RN 4 x 4)

Install the following parts:

(a) Bearing spacer
(b) Shims
(c) Front bearing
(d) Plate washer

If drive pinion preload is not within limits, adjust with shim when assembling the oil seal.

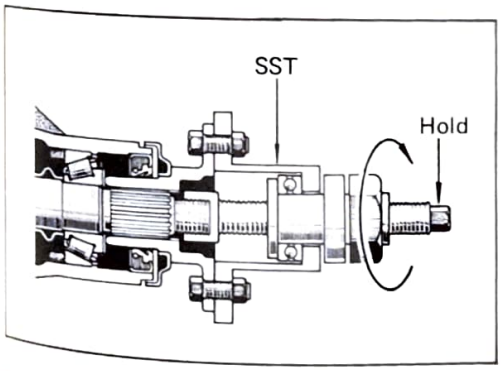


10. INSTALL NEW OIL SEAL

(a) Using a driver*, drive in a new oil seal to a depth of 1.0 mm (0.039 in.) for RN C&C and RN 4x4, and to a depth of 1.5 mm (0.059 in.) for RN 1/2 ton and 3/4 ton.

*SST 09554-30011 or Commercial driver

(b) Apply multipurpose grease to the oil seal.

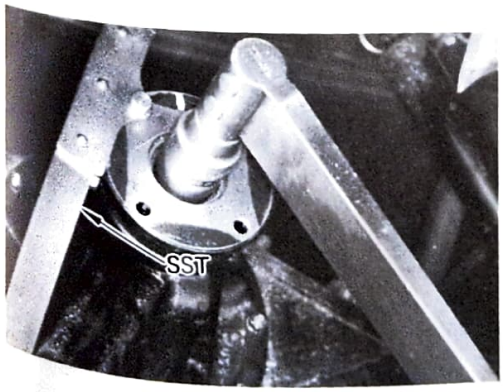


11. INSTALL COMPANION FLANGE

Using a plastic hammer, tap the companion flange on the shaft.

NOTE: If a flange replacer* is available, install the companion flange with it.

*SST 09557-22022



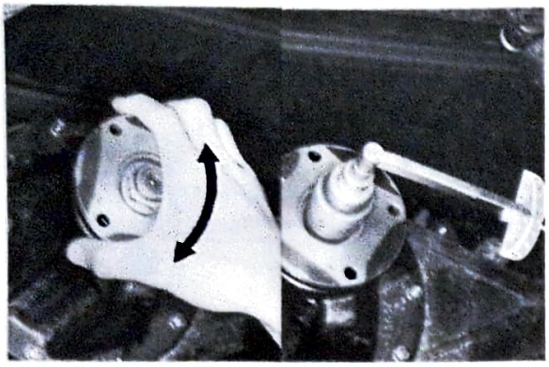
12. TIGHTEN DRIVE PINION NUT AND ADJUST PRELOAD (RN 1/2 ton and 3/4 ton)

(a) Coat the threads of a new nut with multipurpose grease.

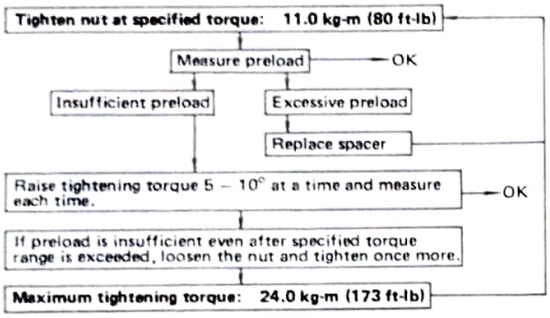
(b) Using a holder* to hold the flange, tighten the nut. Torque the nut.

Torque: 11.0 kg-m (80 ft-lb)

*SST 09330-00020 or Commercial holder



Preload adjusting procedure (RN ½ ton and ¾ ton)



(c) Turn the companion flange several times to snug down the bearing.

(d) Using a torque meter, measure the preload of the backlash between the drive pinion and ring gear.

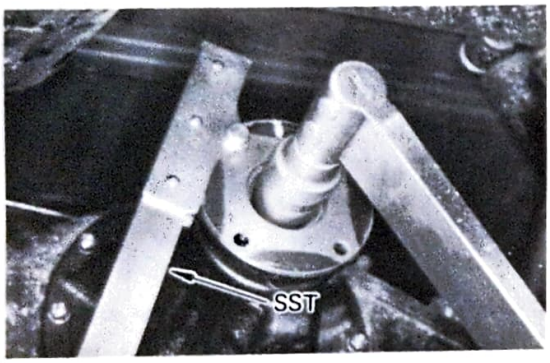
Preload (starting): 6 – 10 kg-cm (5.2 – 8.7 in.-lb)

- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 5 – 10° at a time until the specified preload is reached.

  If the maximum torque is exceeded while re-tightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off pinion nut to reduce the preload.

Maximum torque: 24.0 kg-m (173 ft-lb)

(e) Using a punch, stake the nut.



13. TIGHTEN DRIVE PINION NUT (RN C&C and RN 4 x 4)

(a) Coat the threads of a new nut with multipurpose grease.

(b) Using a holder* to hold the flange, tighten the nut. Torque the nut.

Torque: 17.0 – 21.0 kg-m (123 – 151 ft-lb)

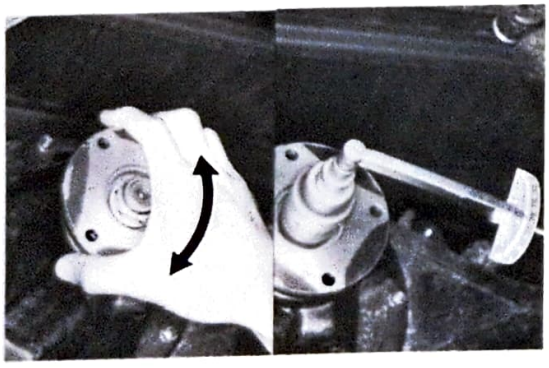
*SST 09330-00020 or Commercial holder

(c) Turn the companion flange several times to snug down the bearing.

(d) Using a torque meter, measure the preload of the backlash between the drive pinion and ring gear.

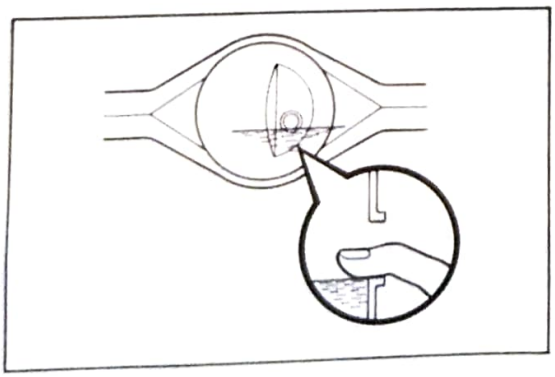
Preload (starting): 9 – 13 kg-cm (7.8 – 11.3 in.-lb)

(e) Using a punch, stake the nut.



14. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE

(See page 12-8)



15. CHECK DIFFERENTIAL OIL LEVEL

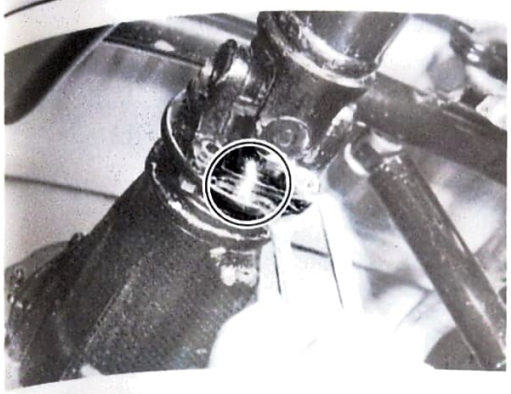
Fill with gear oil if necessary.

Differential oil:

API GL-5 hypoid gear oil
SAE 90 above –18°C (0°F)
SAE 80W or 80W-90 below –18°C (0°F)

Capacity:

RN 1/2 ton and 3/4 ton
1.7 liters (1.8 US qts, 1.5 Imp.qts)
RN C&C 1.8 liters (1.9 US qts, 1.6 Imp.qts)
RN 4x4 2.2 liters (2.3 US qts, 1.9 Imp.qts)



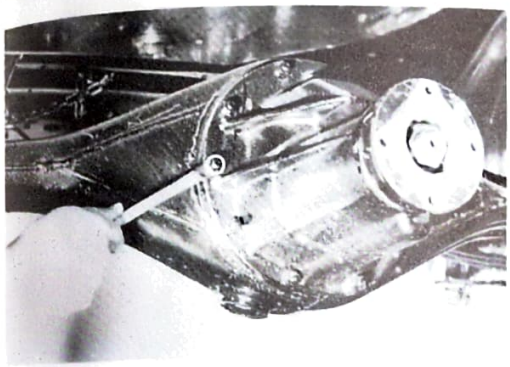
REMOVAL OF DIFFERENTIAL

1. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL

2. REMOVE REAR AXLE SHAFT (See page 14-3)

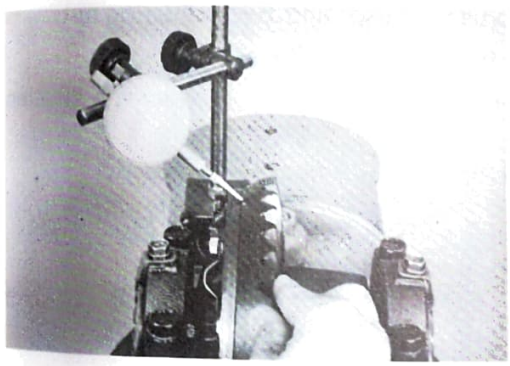
3. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE (See page 12-3)

   Remove four bolts and nuts.



4. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

   Remove 10 nuts and pull out the differential carrier assembly.



DISASSEMBLY OF DIFFERENTIAL
(See illustration on page 14-9)

NOTE: If the differential is noisy, perform the following pre-inspection before disassembly to determine the cause of the noise.

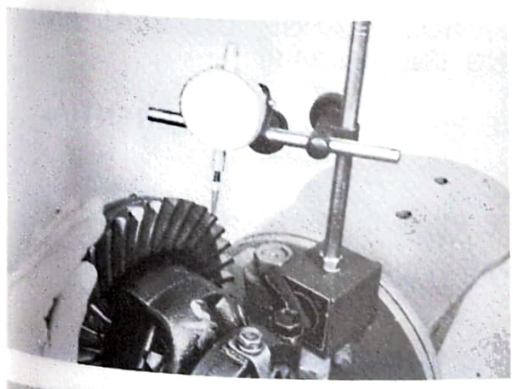
1. PERFORM DIFFERENTIAL PRE-INSPECTION

   (a) Check ring gear runout.

   If the runout is greater than maximum, install a new ring gear.

   Maximum runout:

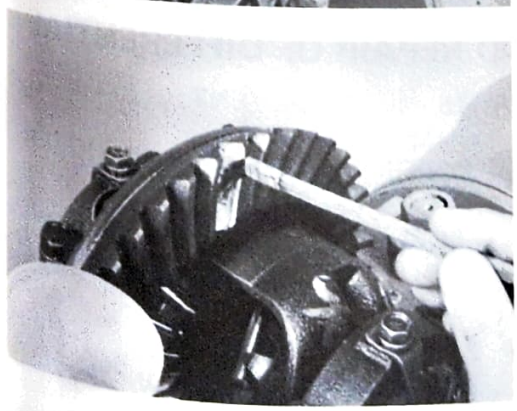
RN 1/2 ton and 3/4 ton	**0.07 mm (0.0028 in.)**
RN C&C and RN 4 x 4	**0.10 mm (0.0039 in.)**



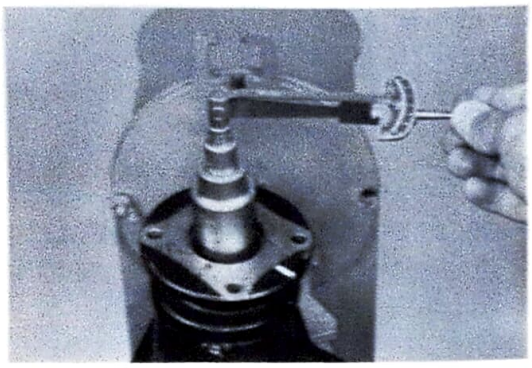
   (b) Check ring gear backlash.

   If the backlash is not within specification, adjust the side bearing preload or repair as necessary. (See step 4, page 14-25)

   Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

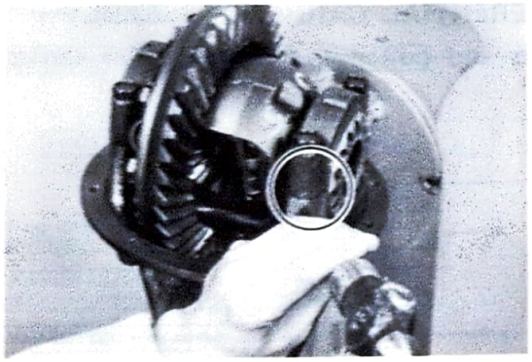


   (c) Check the tooth contact. (See step 5, page 14-26)



(d) Using a torque meter, measure the total preload.

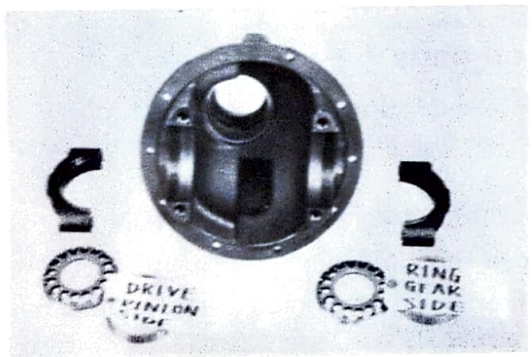
Total preload (Starting):
Drive pinion preload plus **4 – 6 kg-cm (3.5 – 5.2 in.-lb)**



2. REMOVE DIFFERENTIAL CASE AND RING GEAR

(a) Put alignment marks on the bearing cap and differential carrier.

(b) Remove two adjusting nut locks.

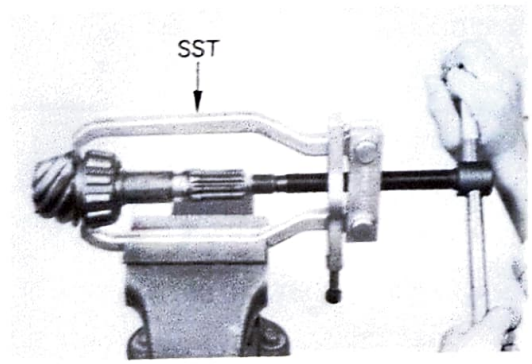


(c) Remove two bearing caps and two adjusting nuts.

(d) Remove the bearing outer races.

NOTE: Tag the bearing outer races to show the location for reassembly.

(e) Remove the differential case from the carrier.



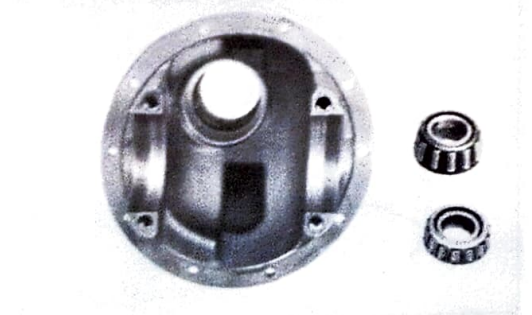
3. REMOVE COMPANION FLANGE, OIL SEAL AND FRONT BEARING (See page 14-9)

4. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

5. REMOVE DRIVE PINION REAR BEARING

Using a universal puller*, remove the rear bearing from the drive pinion.

*SST 09950-20014



INSPECTION AND REPAIR OF DIFFERENTIAL

1. CLEAN ALL PARTS WITH SOLVENT

2. INSPECT DRIVE PINION BEARINGS AND OUTER RACES

If the bearing or outer race are damaged or worn, replace them as a set.

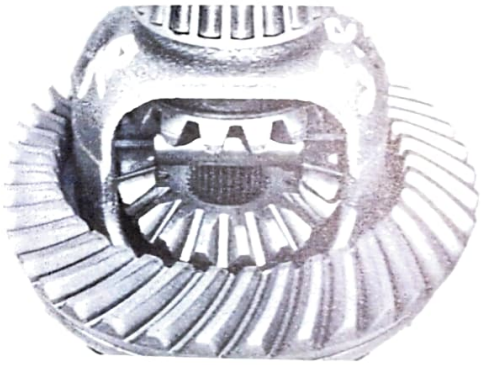
(See page 14-15)

3. INSPECT RING GEAR AND DRIVE PINION

If the ring gear or drive pinion are damaged or worn, replace them as a set. (See page 14-16)

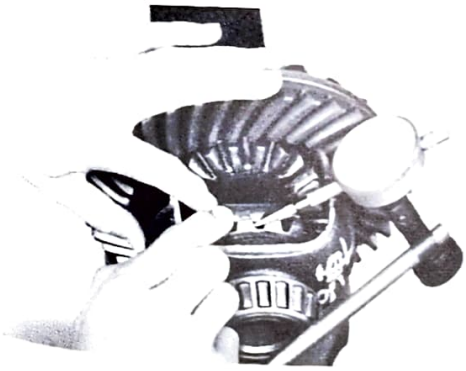
4. INSPECT SIDE BEARINGS AND OUTER RACES

If the side bearings or outer races are damaged or worn, replace the bearing and race. (See page 14-17)



5. INSPECT PINION AND SIDE GEARS

If the pinion or side gears are damaged or worn, replace the gears. (See page 14-17)

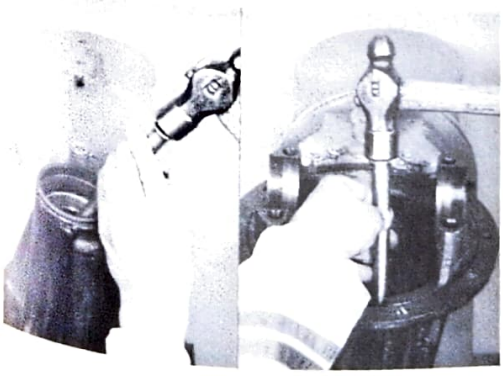


6. CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

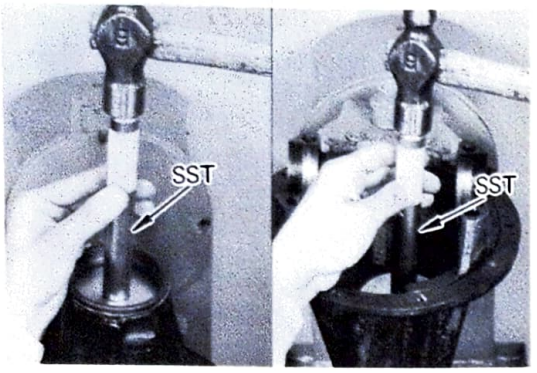
If the backlash is out of specification, install the correct thrust washers. (See page 14-18)



Replacement of Drive Pinion Bearing Outer Races

1. REMOVE FRONT OR REAR DRIVE PINION BEARING OUTER RACE

Using a hammer and punch, drive out the outer race.



2. INSTALL NEW FRONT OR REAR DRIVE PINION BEARING OUTER RACE

Using a hammer and driver*, drive in a new outer race.

*SST 09608-30011 or Commercial driver

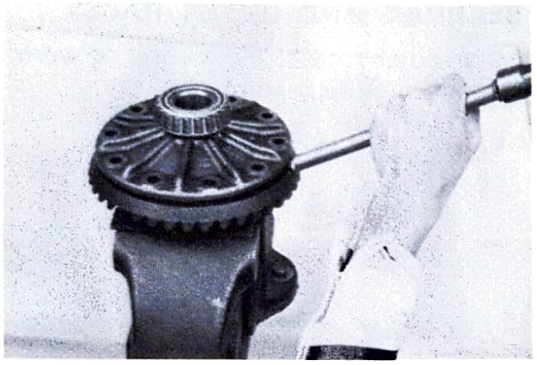
Replacement of Ring Gear

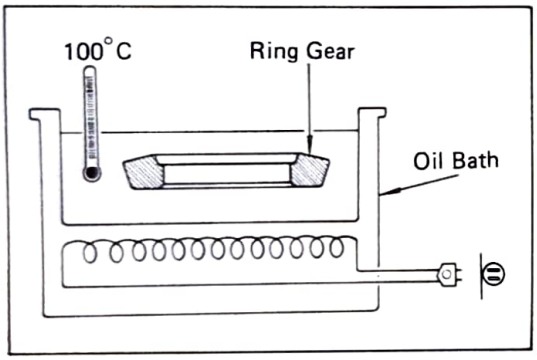
1. REMOVE RING GEAR FROM DIFFERENTIAL CASE

(a) Remove the ring gear set bolts and lock plates.

(b) Using a brass bar and hammer, tap on the ring gear to separate it from the differential case.

CAUTION: Be careful not to damage the side bearing.



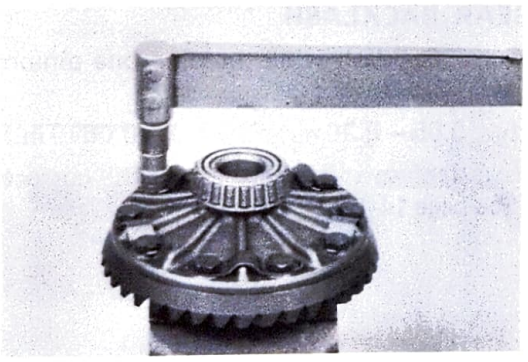


2. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surface of the differential case.

(b) Heat the ring gear to 90 – 110°C (194 – 230°F) in an oil bath. Then quickly install the ring gear on the differential case.

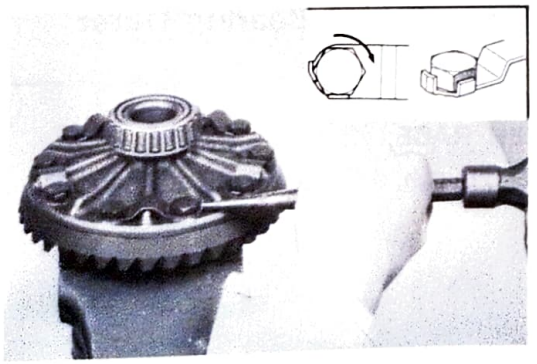
CAUTION: Do not heat the ring gear more than 110°C (230°F).



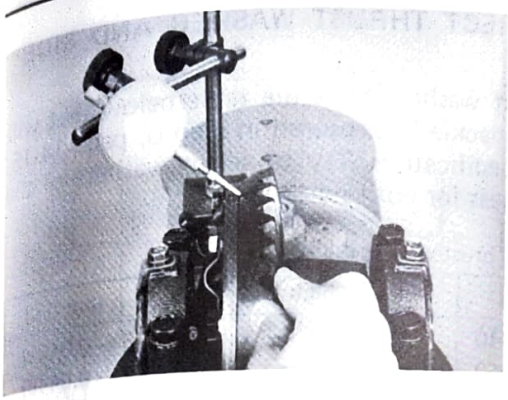
(c) Coat the ring gear set bolts with gear oil.

(d) Install the lock plates and set bolts. Tighten the set bolts uniformly, a little at a time. Torque the bolts.

Torque: 9.2 – 10.5 kg-m (67 – 75 ft-lb)



(e) Using hammer and drift punch, stake the lock plates.



3. CHECK RING GEAR RUNOUT

(a) Install the differential case in the differential carrier.

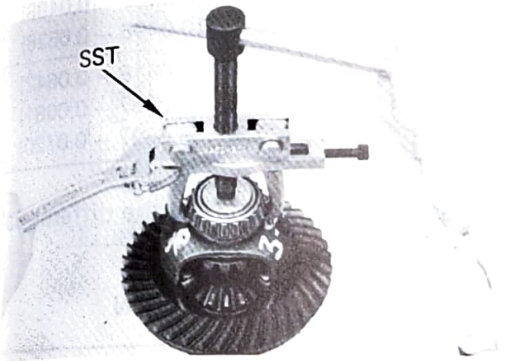
(b) Measure the ring gear runout.

If the runout is greater than the maximum, install a new ring gear.

Maximum runout:

RN 1/2 ton and 3/4 ton	0.07 mm (0.0028 in.)
RN C&C and RN 4 x 4	0.10 mm (0.0039 in.)

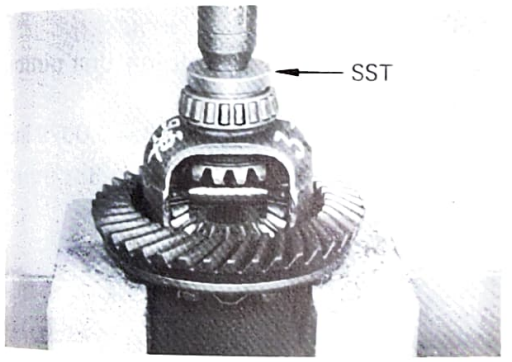
REPLACEMENT OF SIDE BEARINGS



1. REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE

Using a universal puller*, pull the side bearing from the differential case.

*SST 09950-20014

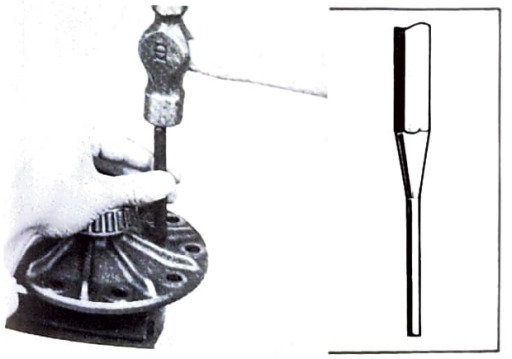


2. INSTALL NEW SIDE BEARINGS

Using a press and driver*, install a new bearing in the differencial case.

*SST 09505-20010 or 09608-30011 or Commercial driver

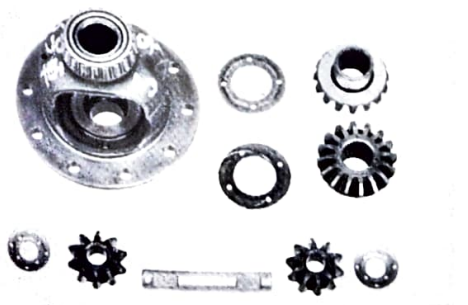
Replacement of Differential Pinion and Side Gears



1. REMOVE RING GEAR FROM DIFFERENTIAL CASE (See page 14-16)

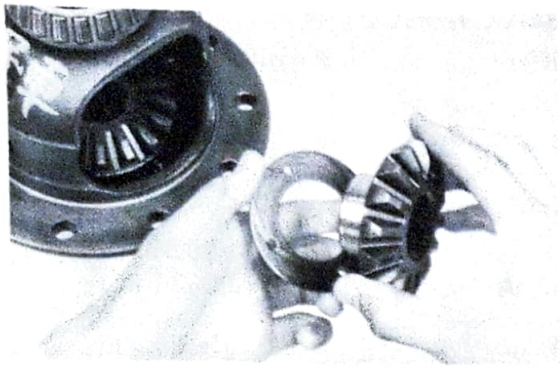
2. DISASSEMBLE DIFFERENTIAL CASE

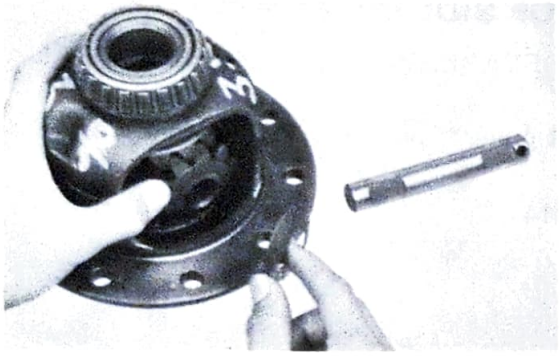
Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and two thrust washers.

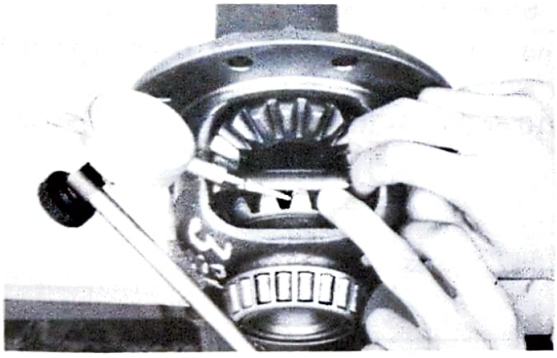


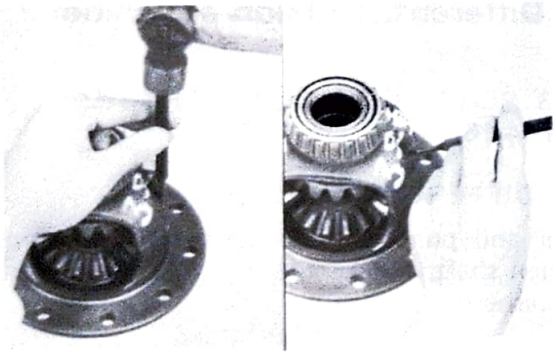
3. INSPECT DIFFERENTIAL CASE PARTS

Replace parts that are damaged or worn.









4. INSTALL CORRECT THRUST WASHER AND SIDE GEARS

(a) Select thrust washers from the table below that will ensure the backlash measured in step 6, page 14-15, is within specification. Try to select washers of the same thickness for both sides.

Thrust washer thickness

Model	Part No.	No.	Thickness mm (in.)
1/2 ton and 3/4 ton	41361-30040	1	0.96 – 1.04 (0.0378 – 0.0409)
	41361-30050	2	1.06 – 1.14 (0.0417 – 0.0449)
	41361-30060	3	1.16 – 1.24 (0.0457 – 0.0488)
	41361-30070	4	1.26 – 1.34 (0.0496 – 0.0528)
RN C&C and RN 4 x 4	41361-40021	1	1.57 – 1.63 (0.0618 – 0.0642)
	41362-40021	2	1.67 – 1.73 (0.0657 – 0.0681)
	41363-40021	3	1.77 – 1.83 (0.0697 – 0.0720)

(b) Install thrust washers and side gears in the differential case.

5. INSTALL PINION GEARS AND SHAFT IN DIFFERENTIAL CASE

6. CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within specification, install a thrust washer of different thickness.

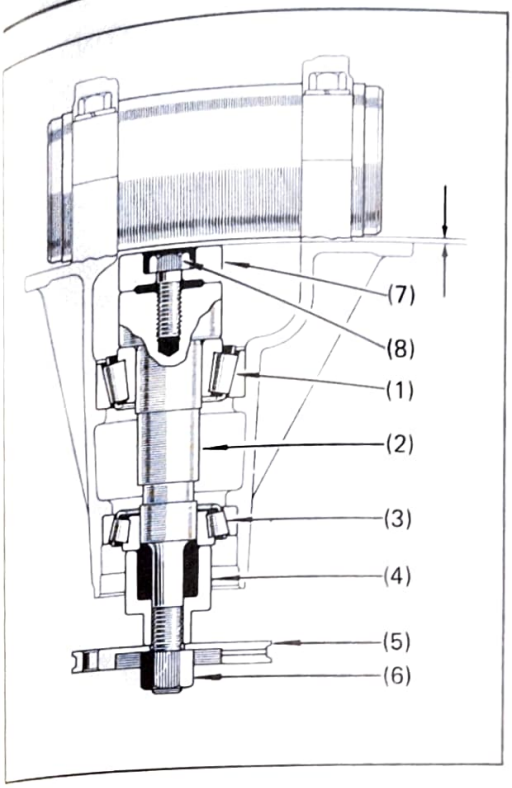
7. INSTALL STRAIGHT PIN

(a) Using a hammer and punch, drive the straight pin through the case and hole in the pinion shaft.

(b) Stake the pin and differential case.

8. INSTALL RING GEAR ON DIFFERENTIAL CASE

(See page 14-16)



ASSEMBLY OF DIFFERENTIAL
(See illustration on page 14-9)

Installation of Drive Pinion (RN 1/2 ton and RN 3/4 ton)

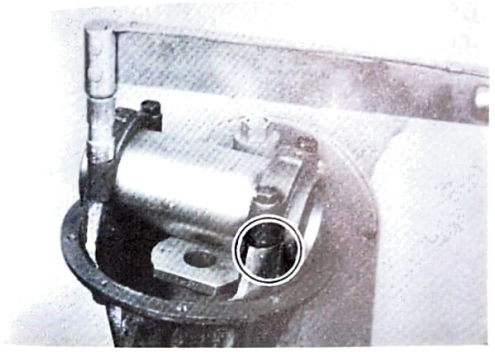
1. ADJUST DRIVE PINION PROTRUSION

(a) Install the bearings and adjusting gauge* in the differential carrier in the order listed below:

(1) Rear bearing
(2) Base rod
(3) Drive pinion front bearing
(4) Collar
(5) Flange
(6) Nut
(7) Base rod head (SST 09536-30030)
(8) Bolt

*SST 09530-30012 and 09536-30030

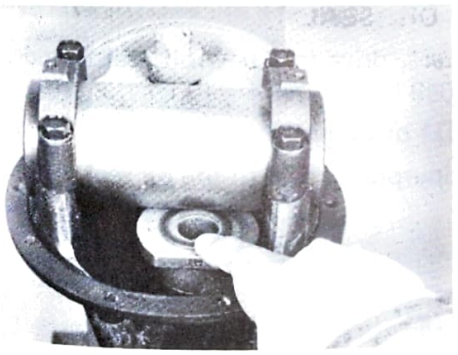
NOTE: Tighten the bolt only to the point where the drive pinion gear has no play.



(b) Place the master gauge on the differential carrier.

(c) Align the marks and install the bearing caps. Torque the bearing cap bolts.

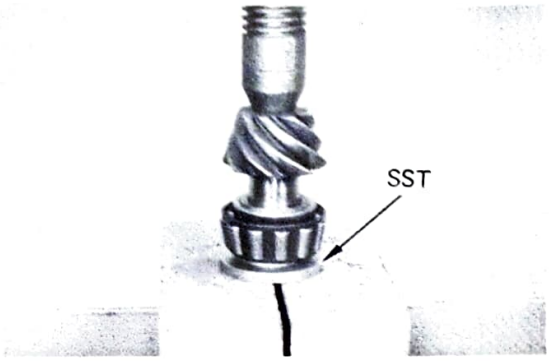
Torque: 7.0 – 9.0 kg-m (51 – 65 ft-lb)



(d) Select a washer that can just be inserted into the clearance between the master gauge and the base rod. Remove the adjusting gauge.

Plate washer thickness (RN 1/2 ton and RN 3/4 ton)

Part No.	No.	Thickness mm (in.)	Part No.	No.	Thickness mm (in.)
90201-35434	1	2.23 – 2.25 (0.0878 – 0.0886)	90201-35401	10	2.50 – 2.52 (0.0984 – 0.0992)
90201-35435	2	2.26 – 2.28 (0.0890 – 0.0898)	90201-35402	11	2.53 – 2.55 (0.0996 – 0.1004)
90201-35436	3	2.29 – 2.31 (0.0902 – 0.0909)	90201-35403	12	2.56 – 2.58 (0.1008 – 0.1016)
90201-35437	4	2.32 – 2.34 (0.0913 – 0.0921)	90201-35404	13	2.59 – 2.61 (0.1020 – 0.1028)
90201-35396	5	2.35 – 2.37 (0.0925 – 0.0933)	90201-35438	14	2.62 – 2.64 (0.1031 – 0.1039)
90201-35397	6	2.38 – 2.40 (0.0937 – 0.0945)	90201-35439	15	2.65 – 2.67 (0.1043 – 0.1051)
90201-35398	7	2.41 – 2.43 (0.0949 – 0.0957)	90201-35440	16	2.68 – 2.70 (0.1055 – 0.1063)
90201-35399	8	2.44 – 2.46 (0.0961 – 0.0969)	90201-35441	17	2.71 – 2.73 (0.1067 – 0.1075)
90201-35400	9	2.47 – 2.49 (0.0972 – 0.0980)			

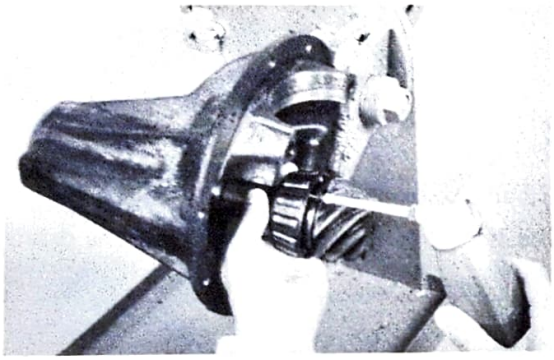


2. **INSTALL REAR BEARING AND WASHER ON DRIVE PINION**

Using a press and bearing replacer*, press the washer and rear bearing on the drive pinion.

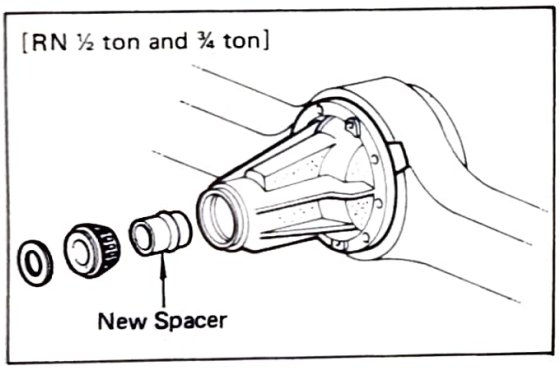
NOTE: The chamfered end of the washer should face toward the gear.

*SST 09506-30011 or Commercial replacer

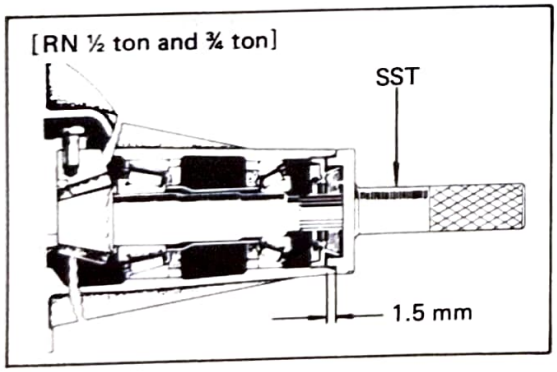


3. **INSTALL DRIVE PINION IN DIFFERENTIAL CARRIER**

Coat the bearings with gear oil and install the drive pinion.



4. **INSTALL NEW BEARING SPACER, FRONT BEARING AND OIL SLINGER**

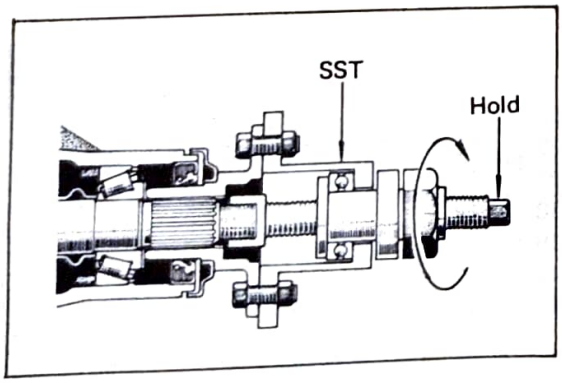


5. **INSTALL NEW OIL SEAL**

(a) Using a driver*, drive in a new oil seal to a depth of 1.5 mm (0.059 in.).

*SST 09554-30011 or Commercial driver

(b) Apply multipurpose grease to the oil seal.

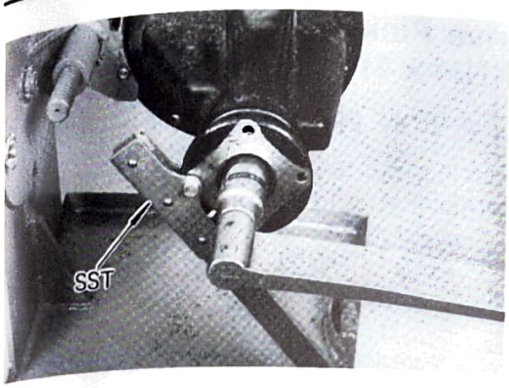


6. **INSTALL COMPANION FLANGE**

Using a plastic hammer, tap the companion flange on the shaft.

NOTE: If a flange replacer* is available, install the companion flange with it.

*SST 09557-22022



7. TIGHTEN DRIVE PINION NUT AND ADJUST PRELOAD

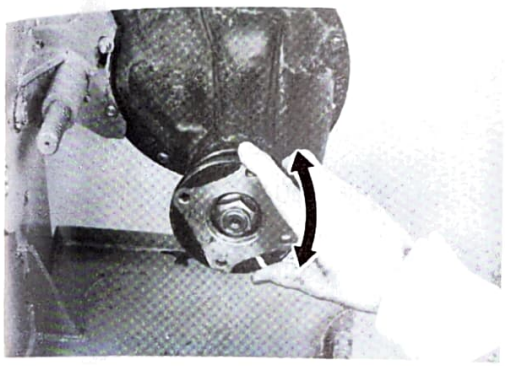
(a) Coat the threads of a new nut with multipurpose grease.

(b) Using a holder* to hold the flange, tighten the nut.

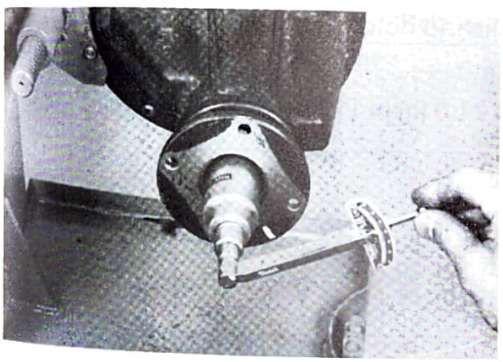
Torque the nut.

Torque: 11.0 kg-m (80 ft-lb)

*SST 09330-00020 or Commercial holder



(c) Turn the companion flange several times to snug down the bearing.



(d) Using a torque meter, measure the preload of the backlash between the drive pinion and ring gear.

Preload (starting):

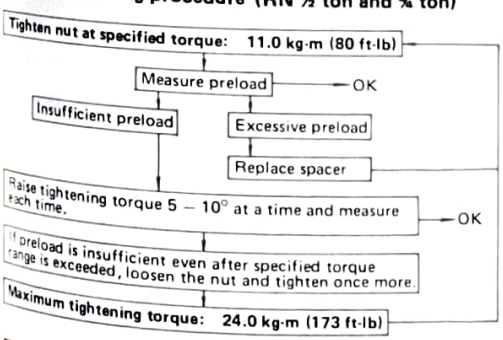
New bearing 12 – 19 kg-cm (10.4 – 16.5 in.-lb)
Reused bearing 6 – 10 kg-cm (5.2 – 8.7 in.-lb)

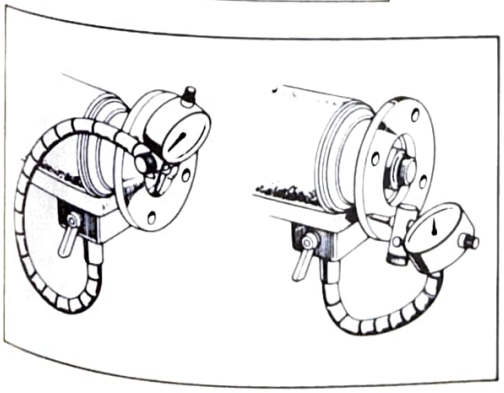
- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 5 – 10° at a time until the specified preload is reached.

  If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off pinion nut to reduce the preload.

Maximum torque: 24.0 kg-m (173 ft-lb)

Preload adjusting procedure (RN ½ ton and ¾ ton)



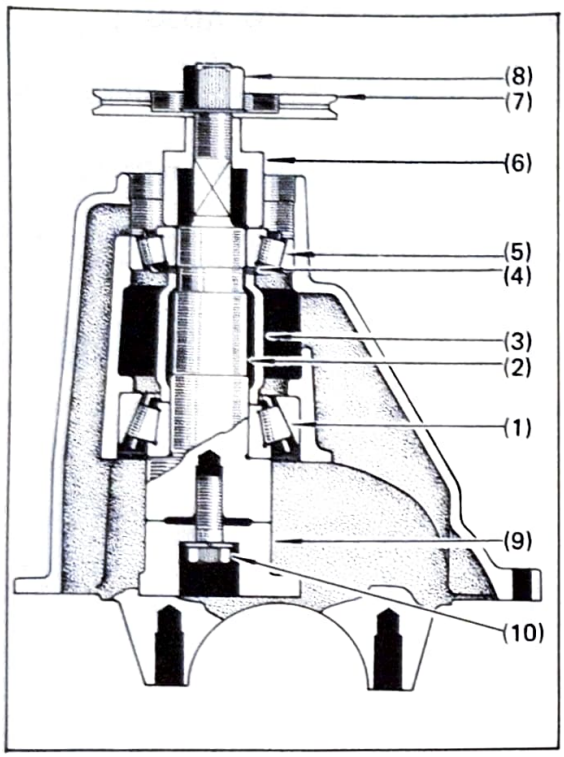


8. CHECK DEVIATION OF COMPANION FLANGE

Using a dial indicator, measure the longitudinal and latitudinal deviation of the companion flange.

If the deviation is greater than the maximum, inspect the bearings.

Maximum longitudinal deviation: 0.10 mm (0.0039 in.)
Maximum latitudinal deviation: 0.10 mm (0.0039 in.)



Installation of Drive Pinion (RN C&C and RN 4×4)

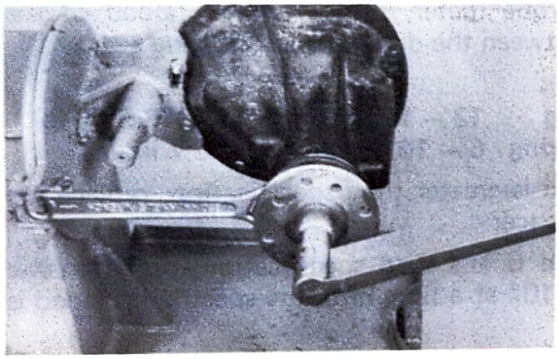
1. ADJUST DRIVE PINION PRELOAD

(a) Install the bearings, spacer, shim and adjusting gauge* in the differential carrier in the order listed below:

(1) Drive pinion rear bearing
(2) Base rod
(3) Spacer
(4) Shim
(5) Drive pinion front bearing
(6) Collar
(7) Flange
(8) Nut
(9) Base rod head (SST 09536-26010)
(10) Bolt

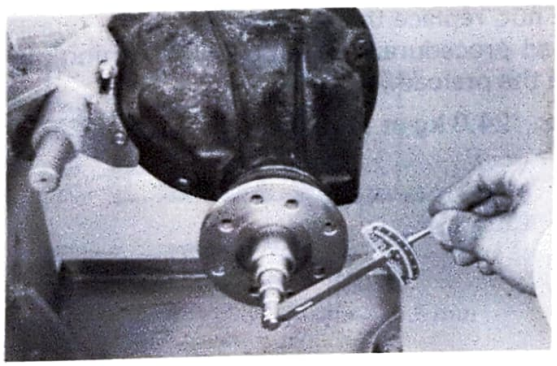
*SST 09530-30012 and 09536-26010

NOTE: Do not install the oil seal.
Do not install the shim for drive pinion height.



(b) Using a wrench to hold the collar, tighten the nut.
Torque the nut.

Torque: 17.0 – 21.0 kg-m (123 – 151 ft-lb)



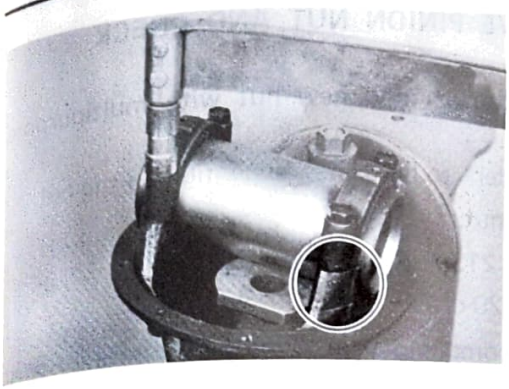
(c) Using a torque meter, measure the preload.

Preload (starting):
New bearing 19 – 26 kg-cm (16.5 – 22.6 in.-lb)
Reused bearing 9 – 13 kg-cm (7.8 – 11.3 in.-lb)

If the preload is not within specification, correct by increasing or decreasing the number of shims.

Shim thickness (RN C&C and RN 4 x 4)

Part No.	No.	Thickness mm (in.)
90564-30035	1	0.23 – 0.27 (0.0091 – 0.0106)
90564-30193	2	0.28 – 0.32 (0.0110 – 0.0126)
90564-30194	3	0.33 – 0.37 (0.0130 – 0.0146)
90564-30195	4	0.38 – 0.42 (0.0150 – 0.0165)
90564-30063	5	0.43 – 0.47 (0.0169 – 0.0185)

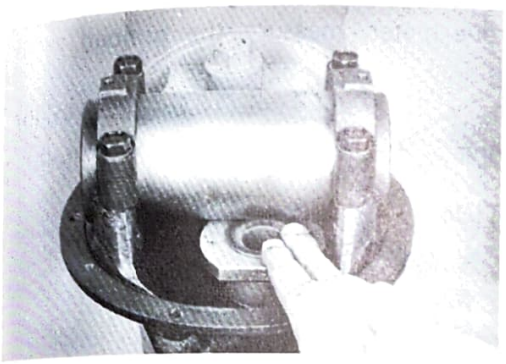


2. ADJUST DRIVE PINION PROTRUSION

(a) Place the master gauge on the differential carrier.

(b) Align the marks and install the bearing caps. Torque the bearing cap bolts.

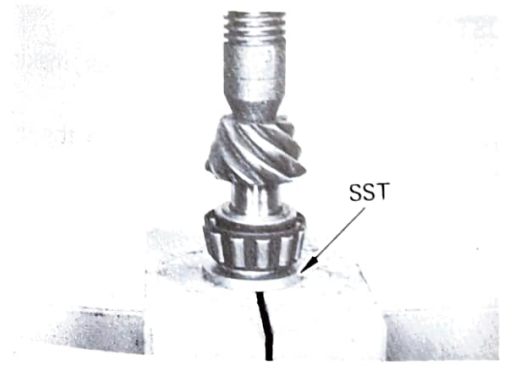
Torque: 7.0 – 9.0 kg-m (51 – 65 ft-lb)



(c) Select a washer that can just be inserted into the clearance between the master gauge and the base rod. Remove the adjusting gauge.

Plate washer thickness (RN C&C and RN 4 x 4)

Part No.	No.	Thickness mm (in.)	Part No.	No.	Thickness mm (in.)
90201-35497	1	1.69 – 1.71 (0.0665 – 0.0673)	90201-35508	12	2.02 – 2.04 (0.0795 – 0.0803)
90201-35498	2	1.72 – 1.74 (0.0677 – 0.0685)	90201-35509	13	2.05 – 2.07 (0.0807 – 0.0815)
90201-35499	3	1.75 – 1.77 (0.0689 – 0.0697)	90201-35510	14	2.08 – 2.10 (0.0819 – 0.0827)
90201-35500	4	1.78 – 1.80 (0.0701 – 0.0709)	90201-35511	15	2.11 – 2.13 (0.0831 – 0.0839)
90201-35501	5	1.81 – 1.83 (0.0713 – 0.0720)	90201-35512	16	2.14 – 2.16 (0.0843 – 0.0850)
90201-35502	6	1.84 – 1.86 (0.0724 – 0.0732)	90201-35513	17	2.17 – 2.19 (0.0854 – 0.0862)
90201-35503	7	1.87 – 1.89 (0.0736 – 0.0744)	90201-35514	18	2.20 – 2.22 (0.0866 – 0.0874)
90201-35504	8	1.90 – 1.92 (0.0748 – 0.0756)	90201-35515	19	2.23 – 2.25 (0.0878 – 0.0886)
90201-35505	9	1.93 – 1.95 (0.0760 – 0.0768)	90201-35516	20	2.26 – 2.28 (0.0890 – 0.0898)
90201-35506	10	1.96 – 1.98 (0.0772 – 0.0780)	90201-35517	21	2.29 – 2.31 (0.0902 – 0.0909)
90201-35507	11	1.99 – 2.01 (0.0783 – 0.0791)	90201-35518	22	2.32 – 2.34 (0.0913 – 0.0921)

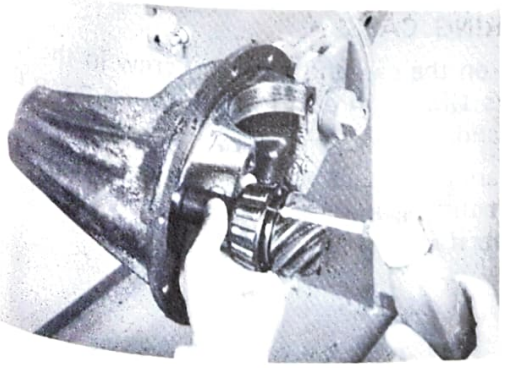


3. INSTALL REAR BEARING AND WASHER ON DRIVE PINION

Using a press and bearing replacer*, press the washer and rear bearing on the drive pinion.

NOTE: The chamfered end of the washer should face the gear.

*SST 09506-30011 or Commercial replacer

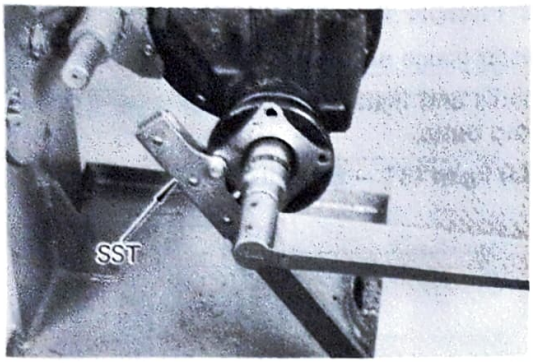


4. INSTALL DRIVE PINION, BEARING SPACER, SHIM, FRONT BEARING AND WASHER IN DIFFERENTIAL CARRIER

Coat the bearings with gear oil and install the drive pinion.

5. INSTALL NEW OIL SEAL (See page 14-11)

6. INSTALL COMPANION FLANGE (See page 14-11)



7. TIGHTEN DRIVE PINION NUT AND CHECK PRELOAD

(a) Coat the threads of a new nut with multipurpose grease.

(b) Using a holder* to hold the flange, tighten the nut.

Torque the nut.

Torque: 17.0 – 21.0 kg-m (123 – 151 ft-lb)

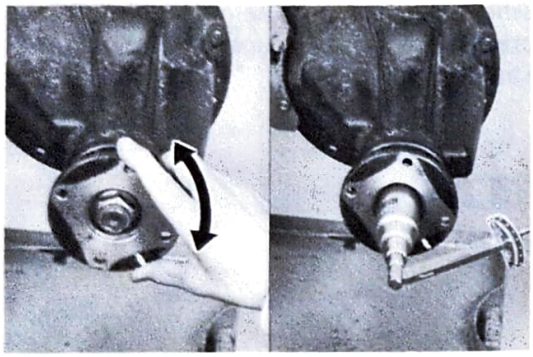
*SST 09330-00020 or Commercial holder

(c) Turn the companion flange several times to snug down the bearing.

(d) Using a torque meter, measure the preload.

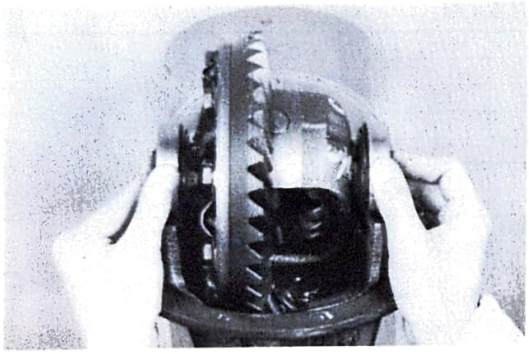
Preload (starting):

New bearing	**19 – 26 kg-cm (16.5 – 22.6 in.-lb)**
Reused bearing	**9 – 13 kg-cm (7.8 – 11.3 in.-lb)**



8. CHECK DEVIATION OF COMPANION FLANGE **(See page 14-21)**

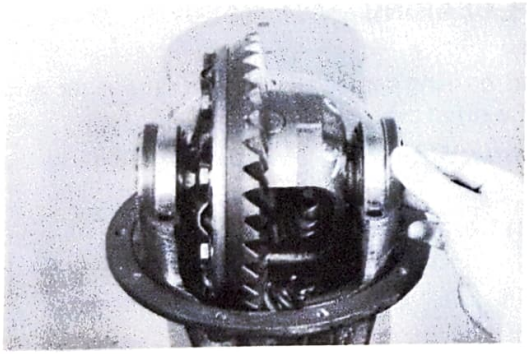
Installation of Differential Case



1. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure left and right races are not interchanged.

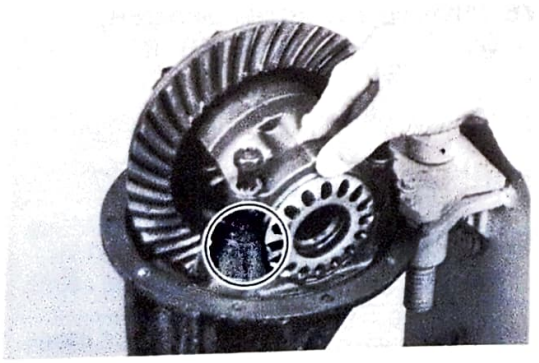
(b) Install the case in the carrier.



2. INSTALL ADJUSTING NUTS

Install the adjusting nuts on their respective carrier, making sure the nuts are threaded properly.

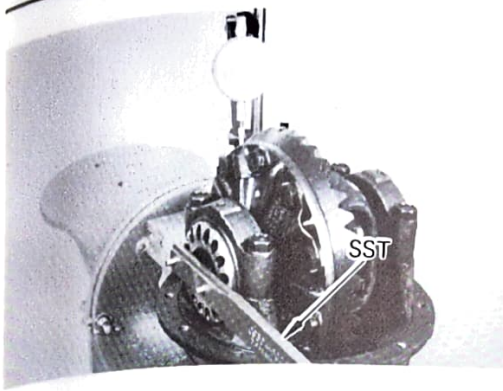
NOTE: Make sure that there is backlash between the ring gear and drive pinion.



3. INSTALL BEARING CAPS

Align the marks on the cap and carrier. Screw in the two bearing cap bolts two or three turns and press down the bearing cap by hand.

NOTE: If the bearing cap does not fit tightly on the carrier, the adjusting nut threads are not threaded properly. Reinstall adjusting nuts if necessary.

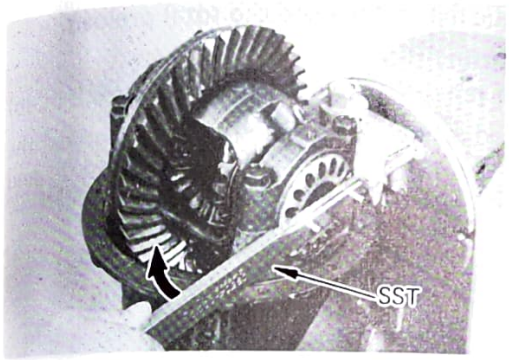


4. ADJUST SIDE BEARING PRELOAD

(a) Tighten the bearing cap bolts until the spring washers are slightly compressed.

(b) Using an adjusting nut wrench*, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.008 in.).

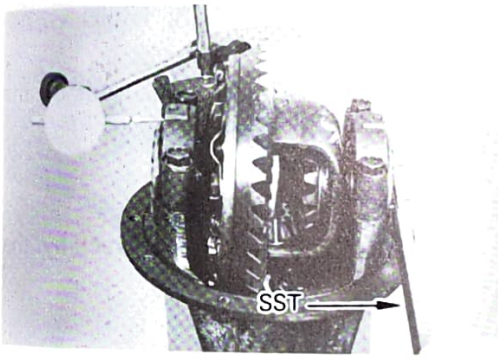
*SST 09504-00010 or Commercial wrench



(c) Using an adjusting nut wrench, firmly tighten the adjusting nut on the drive pinion side.

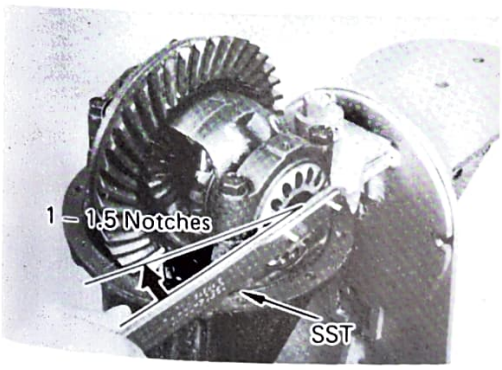
(d) Check the ring gear backlash.

If tightening the adjusting nut creates ring gear backlash, loosen the nut so that backlash is eliminated.

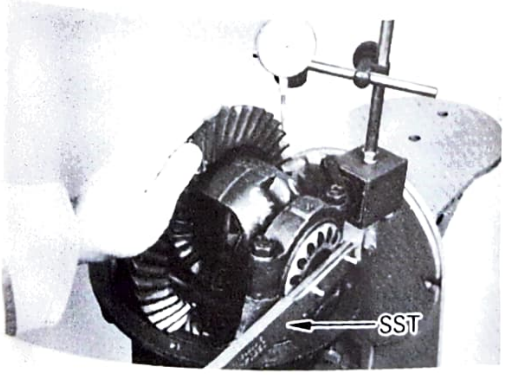


(e) Place a dial indicator on the top of the bearing cap on the ring gear side.

(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.



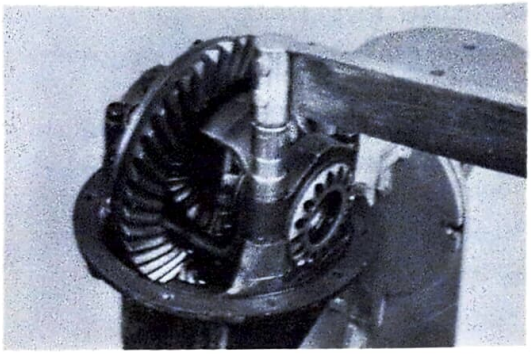
(g) Tighten the adjusting nut 1 to 1-1/2 notches from the zero preload position.



(h) Using a dial indicator and adjusting nut wrench, adjust the ring gear backlash until the backlash is within specification.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

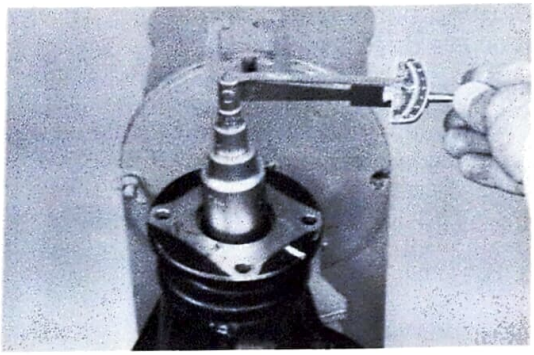
NOTE: The backlash is adjusted by turning the left and right adjusting nuts equal amounts. For example, loosen the nut on the left side one notch and tighten the nut on the right side one notch.



(i) Torque the bearing cap bolts.

Torque: 7.0 – 9.0 kg-m (51 – 65 ft-lb)

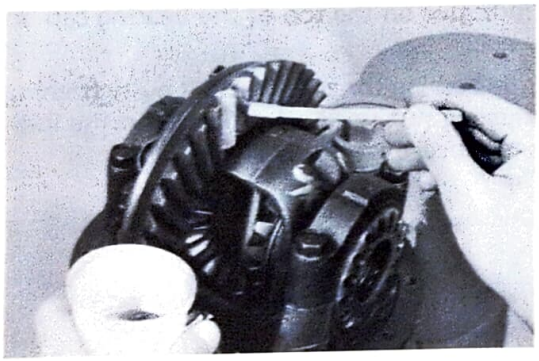
(j) Recheck the ring gear backlash.



(k) Using a torque meter, measure the total preload.

Total preload (Starting):
Drive pinion preload plus 4–6 kg-cm (3.5–5.2 in.-lb)

If the total preload is not within specification, readjust the preloads in step 7, page 14-21 or step 7, page 14-24 and step 4, page 14-25.



5. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

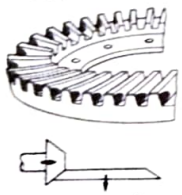
(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Rotate the ring gear in both directions.

(c) Inspect the tooth pattern.

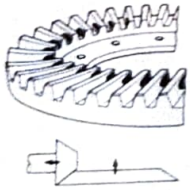
If the teeth are not contacting properly, correct by the method shown below.

Heel Contact



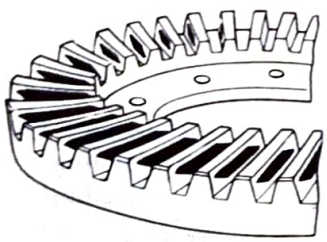
Select a washer that will bring drive pinion closer to ring gear.

Toe Contact

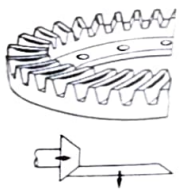


Select a washer that will shift drive pinion away from ring gear.

Proper Contact

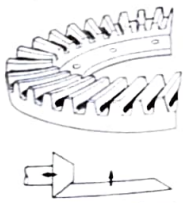


Face Contact

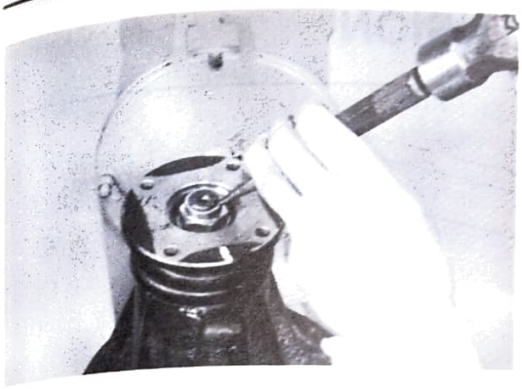


Select a washer that will bring drive pinion closer to ring gear.

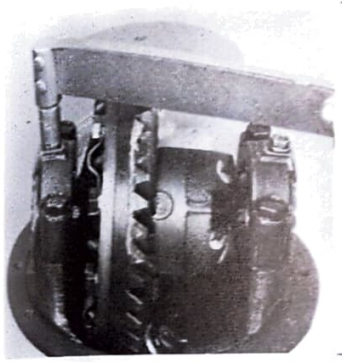
Flank Contact

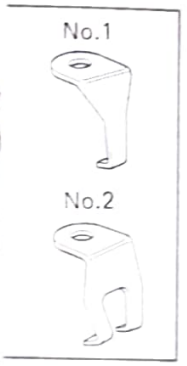


Select a washer that will shift drive pinion away from ring gear.

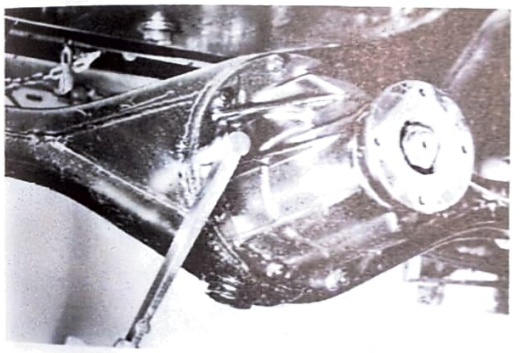


6. STAKE DRIVE PINION NUT





7. INSTALL ADJUSTING NUT LOCKS
   (a) Select lock No. 1 or No. 2 that will fit in the adjusting nuts.
   (b) Install the lock on the bearing caps.

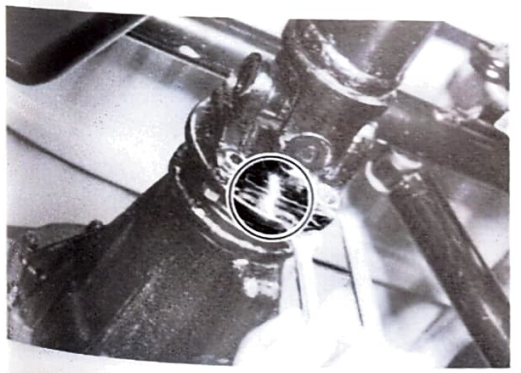


INSTALLATION OF DIFFERENTIAL

1. INSTALL DIFFERENTIAL CARRIER ASSEMBLY

   Install differential carrier assembly in the axle and install 10 nuts.

   Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)

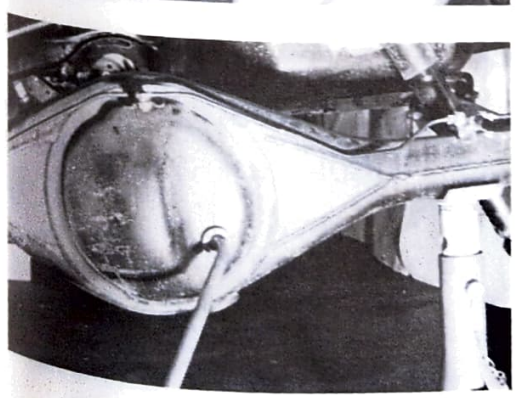


2. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE (See page 12-8)

   Torque four bolts and nuts.

   Torque: 3.0 – 5.0 kg-m (22 – 36 ft-lb)

3. INSTALL REAR AXLE SHAFT (See page 14-7)



4. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

   Differential oil:

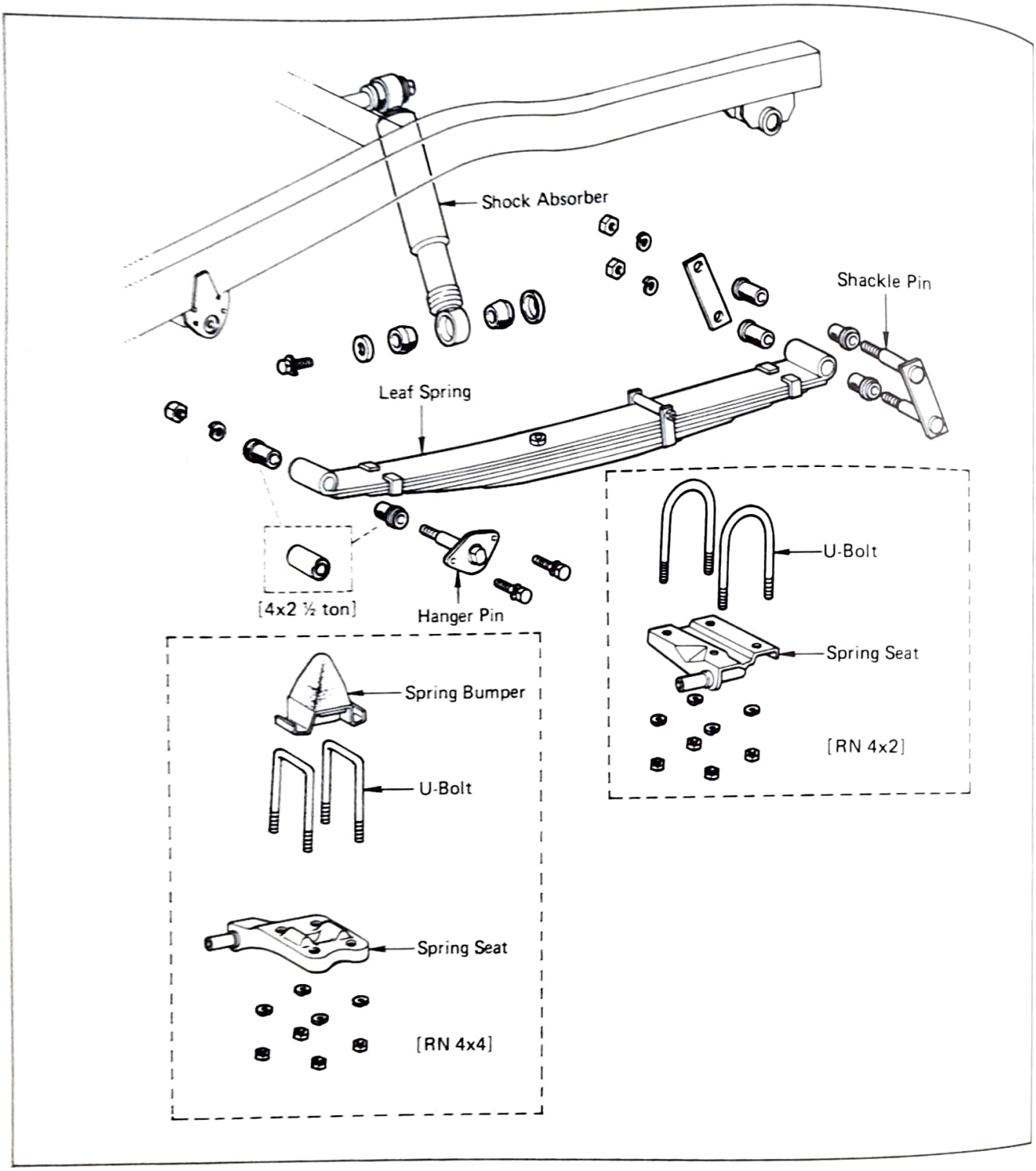
   API GL-5 hypoid gear oil
   SAE 90 above –18°C (0°F)
   SAE 80W or 80W-90 below –18°C (0°F)

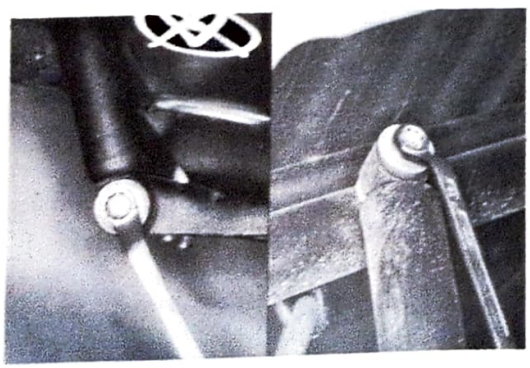
   Capacity:

   RN 1/2 ton, 3/4 ton
   1.7 liters (1.8 US qts, 1.5 Imp.qts)
   RN C&C 1.8 liters (1.9 US qts, 1.6 Imp.qts)
   RN 4x4 2.2 liters (2.3 US qts, 1.9 Imp.qts)

   Install a filler plug.

REAR SUSPENSION





Rear Shock Absorber

REMOVAL OF REAR SHOCK ABSORBER

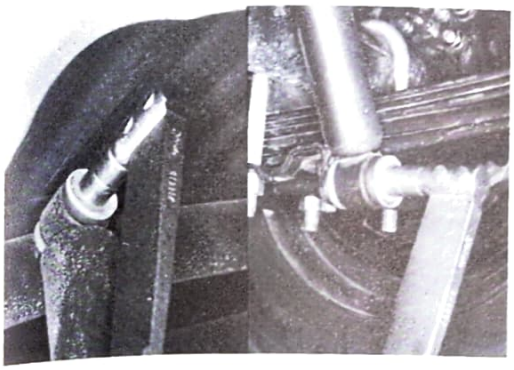
1. DISCONNECT SHOCK ABSORBER FROM SPRING SEAT
2. DISCONNECT SHOCK ABSORBER FROM FRAME

INSPECTION OF REAR SHOCK ABSORBER

INSPECT REAR SHOCK ABSORBER

(a) Inspect the rear shock absorber component parts for wear or damage.

(b) Inspect the rear shock absorber operation.



INSTALLATION OF REAR SHOCK ABSORBER
(See illustration on page 14-28)

1. CONNECT SHOCK ABSORBER TO FRAME

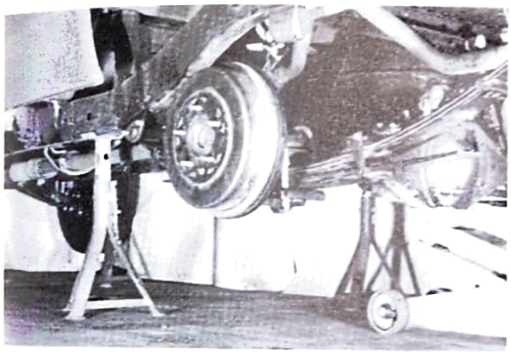
Connect the shock absorber to the frame with the bolt. Tighten the bolt.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)

2. CONNECT SHOCK ABSORBER TO SPRING SEAT

Connect the shock absorber to the spring seat with the bolt. Tighten the bolt.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)



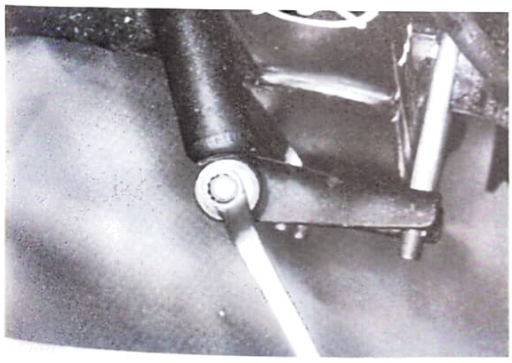
Leaf Spring

REMOVAL OF LEAF SPRING
(See illustration on page 14-28)

1. JACK UP AND SUPPORT FRAME

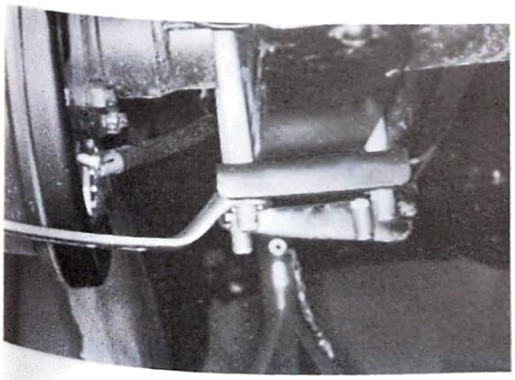
(a) Jack up and support the frame on the stands.

(b) Lower the axle housing until the leaf spring force is free, and keep it at this position.



2. DISCONNECT REAR SHOCK ABSORBER FROM SPRING SEAT

Remove the bolt and disconnect the shock absorber from the spring seat.

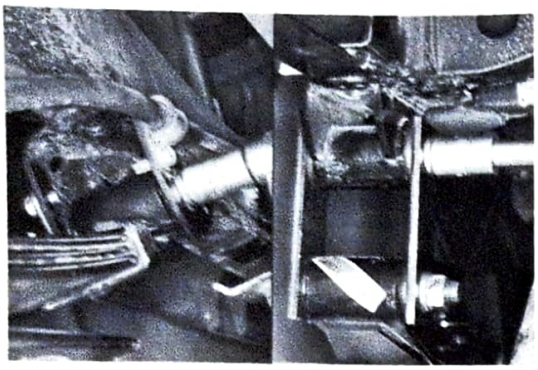


3. REMOVE U-BOLTS

(a) Remove the U-bolt mounting nuts.

(b) Remove the following parts:

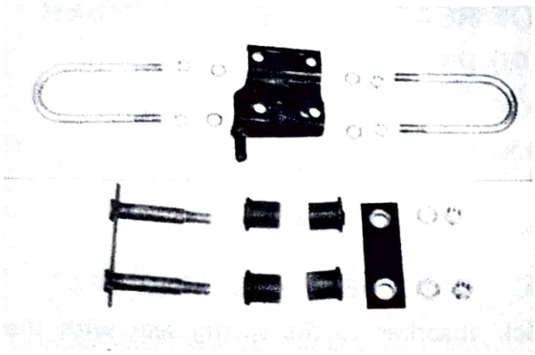
- Spring seat
- U-bolts
- Spring bumper (RN 4 x 4)



4. REMOVE LEAF SPRING

(a) Remove the shackle pin and hanger pin from the leaf spring.

(b) Remove the leaf spring.



INSPECTION OF LEAF SPRING

1. INSPECT U-BOLTS AND SPRING SEAT

Inspect the parts for wear or damage.

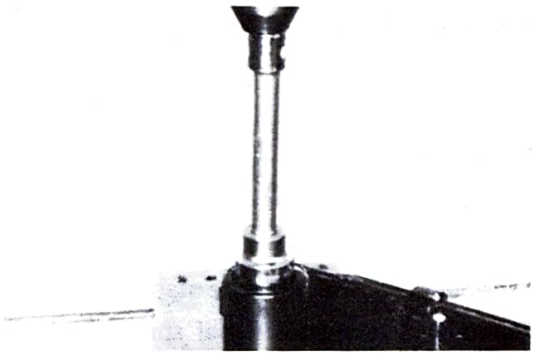
2. INSPECT SHACKLE PIN AND HANGER PIN

Inspect the parts for wear or damage.

3. INSPECT LEAF SPRING

Inspect the leaf spring for weakeness or damage.

If the leaf spring is weakened or damaged, replace the leaf.



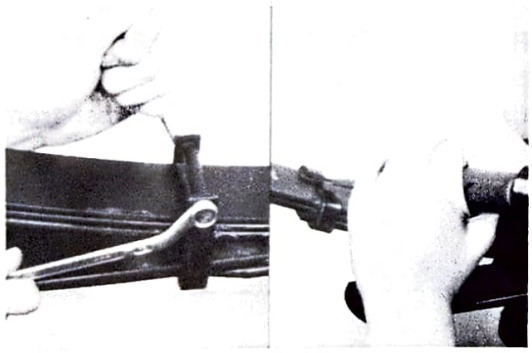
Replacement of Eye Bushing

1. PRESS OUT EYE BUSHING

Using a socket wrench, press out the eye bushing.

2. PRESS IN EYE BUSHING

Using a socket wrench, press in the new eye bushing.



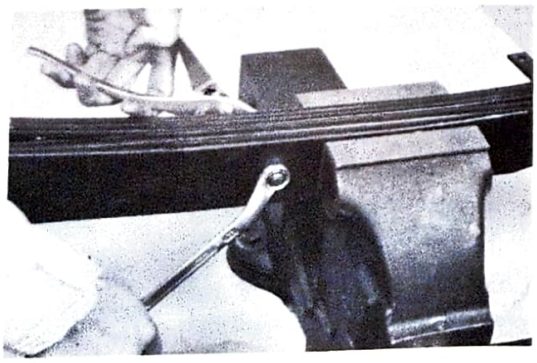
Replacement of Leaf

1. REMOVE CLIP BOLT

Remove the clip bolt and collar from the clip.

2. PRY UP SPRING CLIP

Using a chisel, pry up the spring clip.

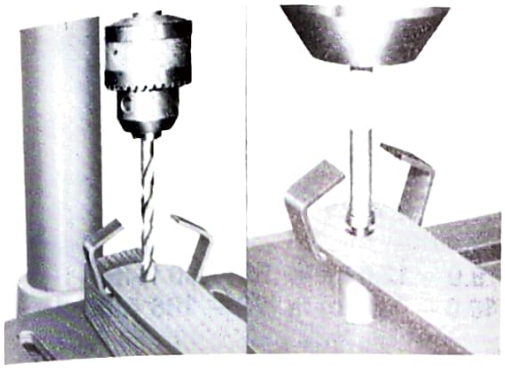


3. REMOVE SPRING CENTER BOLT

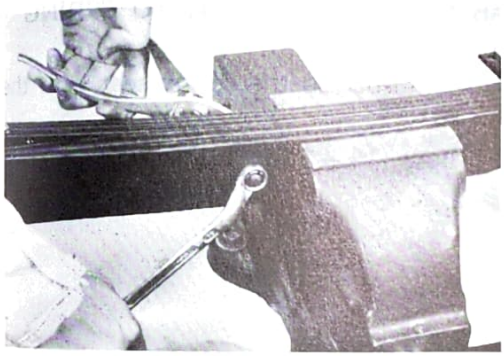
Secure the spring with a vise and remove the spring center bolt.

4. INSPECT LEAVES
   (a) Inspect the leaves for weakness or damage.
   (b) Inspect the spring clip for damage.

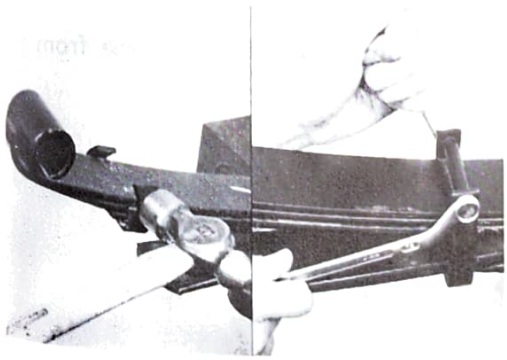
   If the spring clip is damaged, replace it.



5. IF NECESSARY, REPLACE SPRING CLIP
   (a) Drill off the head of the rivet, then drive it out.
   (b) Install a new rivet into the holes of the spring leaf and clip, then rivet with a press.



6. INSTALL SPRING CENTER BOLT
   (a) Align the leaf holes and secure the leaves with a vise.
   (b) Install and tighten the spring center bolt firmly.
   (c) Stake the nut.

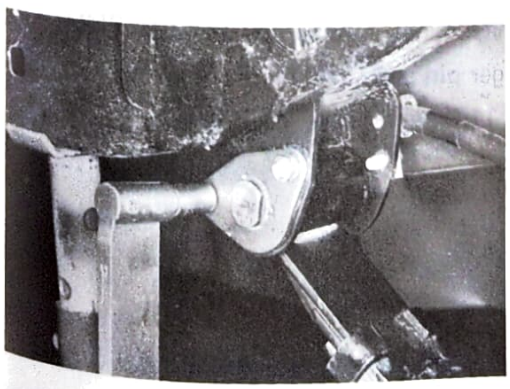


7. INSTALL CLIP BOLT

   Position the collar and install the clip bolt. Tighten the bolt.

8. BEND SPRING CLIP

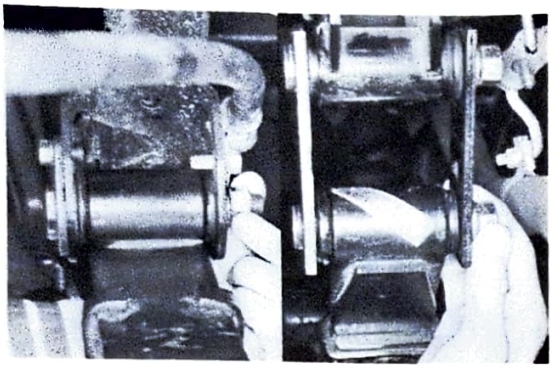
   Using a hammer, bend the spring clip into the position.



INSTALLATION OF LEAF SPRING
(See illustration on page 14-28)

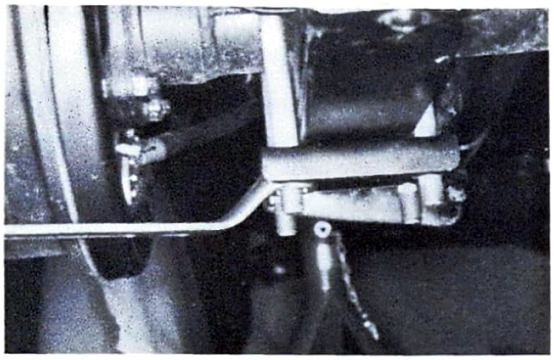
1. INSTALL LEAF SPRING
   (a) Insert the bushings into the frame and into both ends of the spring.
   (b) Place the leaf spring in position, and install the hanger pin. Tighten the bolts.

   Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



(c) Finger tighten the hanger pin mounting nut.

(d) Install the shackle pin and finger tighten the nuts.



2. INSTALL U-BOLTS

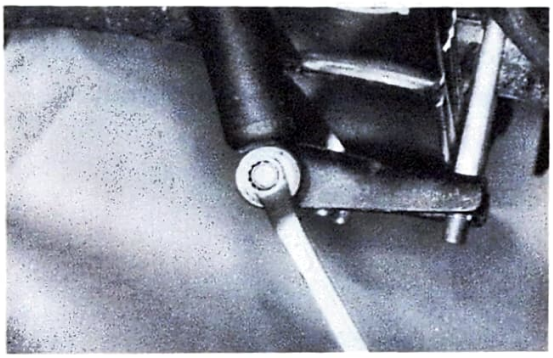
(a) Install the following parts:

- Spring bumper (RN 4 x 4)
- U-bolts
- Spring seat

(b) Tighten the U-bolt mounting nuts.

Torque:

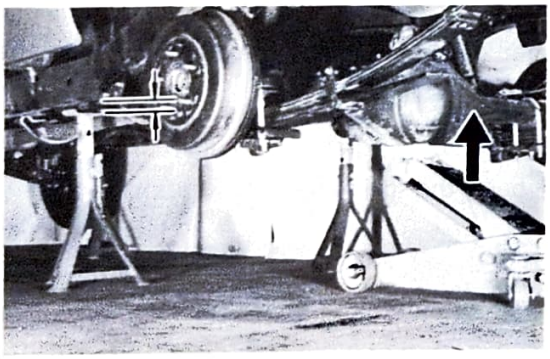
RN 4 x 2 8.0 – 12.0 kg-m (58 – 86 ft-lb)
RN 4 x 4 10.0 – 15.0 kg-m (73 – 108 ft-lb)



3. CONNECT REAR SHOCK ABSORBER TO SPRING SEAT

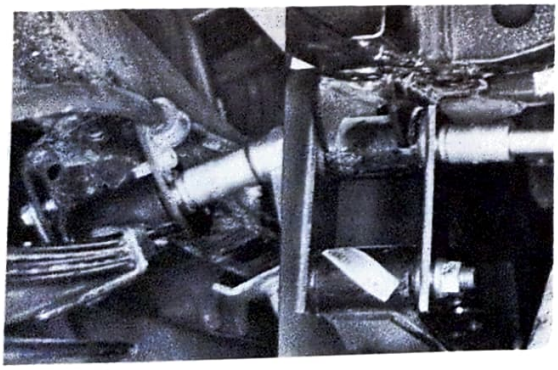
Connect the shock absorber to the spring seat with the bolt. Tighten the bolt.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)



4. RAISE REAR AXLE HOUSING

Raise the axle housing until the vehicle is free from the stands.



5. TIGHTEN HANGER PIN AND SHACKLE PIN

Tighten the hanger pin and shackle pin nuts.

Torque: 7.5 – 11.0 kg-m (55 – 79 ft-lb)

BRAKE SYSTEM

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PRECAUTIONS

1. Care must be taken to replace each part properly as they could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.

2. It is very important to keep parts and area clean when repairing the brake system.

TROUBLESHOOTING

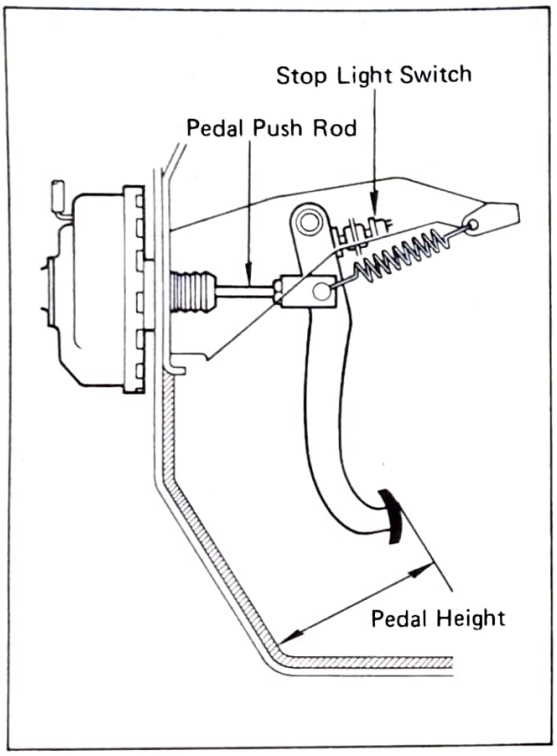
Problem	Possible cause	Remedy	Page
Low or spongy pedal	Linings worn	Replace brake shoes or pads	15-15, 27
	Leak in brake system	Repair leak	
	Master cylinder faulty	Repair or replace master cylinder	15-7
	Air in brake system	Bleed brake system	15-6
	Wheel cylinder faulty	Repair wheel cylinder	15-27
	Piston seals worn or damaged	Repair brake calipers	15-15
Brakes drag	Parking brake out of adjustment	Adjust parking brake	15-5
	Binding parking brake wire	Repair as necessary	
	Booster push rod out of adjustment	Adjust push rod	15-13
	Return spring faulty	Replace spring	15-27
	Brake line restricted	Repair as necessary	15-55
	Lining cracked or distorted	Replace brake shoe	15-27
	Wheel cylinder or caliper piston sticking	Repair as necessary	15-15, 27
	Automatic adjuster broken	Replace adjuster	15-27
	Master cylinder faulty	Repair or replace master cylinder	15-7
Brakes pull	Tires improperly inflated	Inflate tires to proper pressure	
	Oil or grease on linings	Check for cause. Replace lining	15-15, 27
	Brake shoes distorted, linings worn or glazed	Replace brake shoes	15-15, 27
	Drum or disc out of round	Replace drum or disc	15-15, 27
	Return spring faulty	Replace spring	15-27
	Wheel cylinder faulty	Repair wheel cylinder	15-27
	Piston frozen in caliper	Repair caliper	15-15
	Disc brake pad sticking	Replace pads	15-15
Brakes grab/ chatter	Oil or grease on linings	Check for cause. Replace lining	15-15, 27
	Drum or disc scored or out of round	Replace drum or disc	15-15, 27
	Brake shoes distorted, linings worn or glazed	Replace brake shoes	15-15, 27
	Wheel cylinder faulty	Repair wheel cylinder	15-27
	Disc brake pad sticking	Replace pads	15-15
	Brake booster faulty	Repair booster	15-10
Hard pedal but brakes inefficient	Oil or grease on linings	Check for cause. Replace lining	15-15, 27
	Brake shoes distorted, linings worn or glazed	Replace brake shoes	15-15, 27
	Disc brake pads worn	Replace pads	15-15
	Piston frozen in caliper	Repair caliper	15-15
	Brake booster faulty	Repair booster	15-10
	L.S.P.V. out of adjustment or faulty	Adjust or replace L.S.P.V.	15-50
	Brake line restricted	Repair as necessary	15-55

SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Flare nut wrench	09751-36011 or Commercial	To disconnect brake tubes
Brake booster tester	Commercial	To test operation of booster
Booster overhaul tool	09738-00010	To separate front and rear shells
Push rod gauge	09737-00010	To adjust length of push rod
Brake adjusting tool	09704-10010 or Commercial	To adjust brake
Brake shoe return spring tool	09703-30010 or Commercial	To replace return spring
Brake shoe return spring remove	09717-20010	To remove return spring
Brake shoe return spring replacer	09718-20010	To install return spring
Shoe hold down spring tool	09718-00010	To replace shoe hold down spring

CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL



1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height: 157 – 167 mm (6.18 – 6.57 in.)

If incorrect, adjust the pedal height.

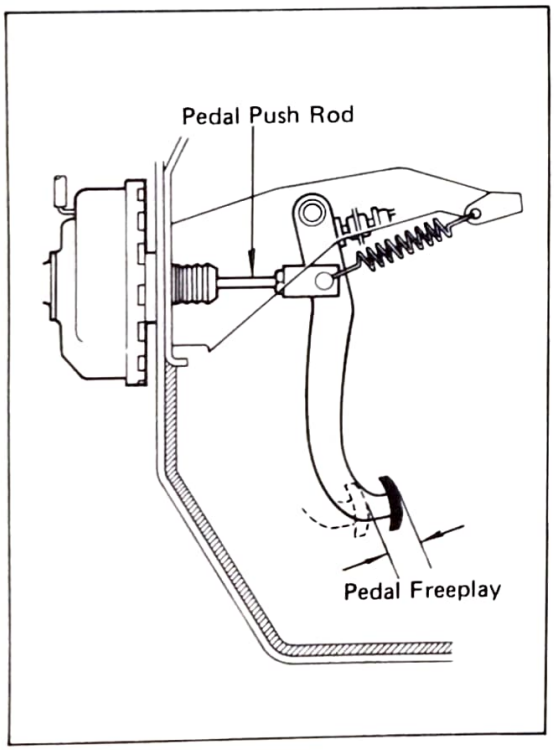
2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Sufficiently loosen the stop light switch.

(b) Adjust the pedal height by turning the pedal push rod.

(c) Return the stop light switch until its body lightly contacts the pedal stopper.

NOTE: After adjusting the pedal height, check and adjust the pedal freeplay.



3. CHECK AND ADJUST PEDAL FREEPLAY

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) Push in the pedal until the beginning of resistance is felt. Measure the distance, as shown.

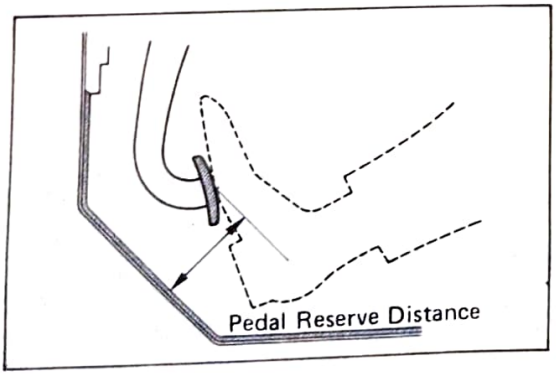
Pedal freeplay: 3 – 6 mm (0.12 – 0.24 in.)

NOTE: The pedal freeplay is the amount of the stroke until the booster air valve is moved by the pedal push rod.

(c) If incorrect, adjust the pedal freeplay by turning the pedal push rod.

(d) Start the engine and confirm that the pedal freeplay exists.

NOTE: After adjusting the pedal freeplay, check the pedal height.



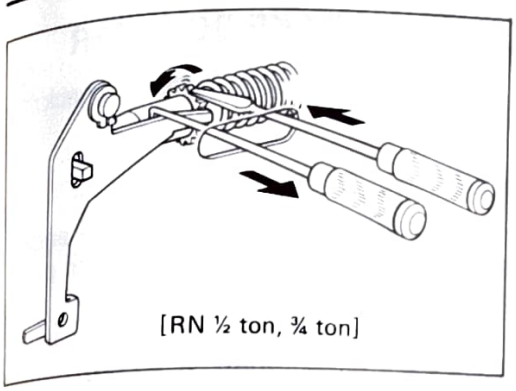
4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT

Depress the pedal and measure the pedal reserve distance, as shown.

Pedal reserve distance from floor panel at 50 kg (110 lb):

4x2	**More than 76.2 mm (3.000 in.)**
4x4	**More than 85.0 mm (3.346 in.)**

If incorrect, troubleshoot the brake system.



[RN ½ ton, ¾ ton]

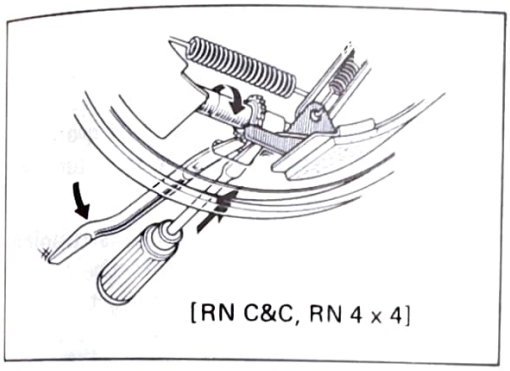
ADJUSTMENT OF REAR BRAKE

1. JACK UP VEHICLE AND RELEASE PARKING BRAKE

2. REMOVE SHOE ADJUSTING HOLE PLUG FROM REAR BRAKE BACKING PLATE

3. EXPAND SHOE UNTIL WHEEL IS COMPLETELY LOCKED

   Using a brake adjusting tool, turn the adjuster.



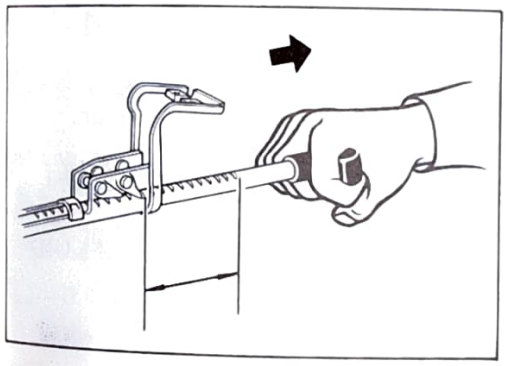
[RN C&C, RN 4 x 4]

4. LOOSEN ADJUSTER UNTIL WHEEL TURNS FREELY

   While detouching the adjuster lever from the adjuster, loosen the adjuster until the wheel turns freely.

   Standard number of notches to be backed off:
   10 – 12 notches

5. INSTALL SHOE ADJUSTING HOLE PLUG



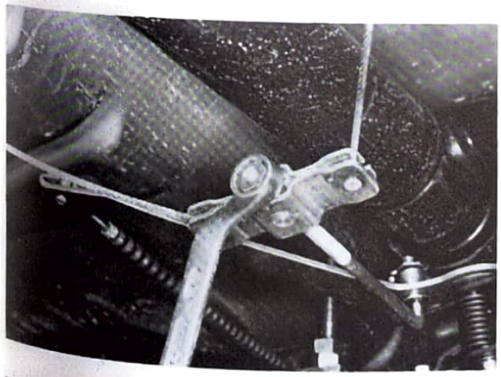
CHECK AND ADJUSTMENT OF PARKING BRAKE

1. CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT

   Pull the parking brake lever all the way, and count the notches of lever travel.

   Lever travel at 20 kg (44 lb): 7 – 15 clicks

   If incorrect, adjust the parking brake.



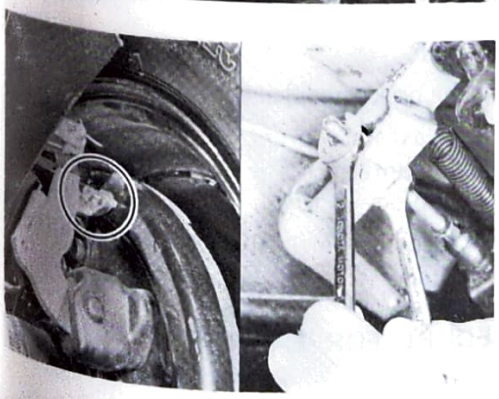
2. IF NECESSARY, ADJUST PARKING BRAKE

   NOTE: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.

   (RN 4 x 2)

   (a) Tighten the adjusting nut until the travel is correct.

   (b) After adjusting the parking brake, confirm that the rear brakes are not dragging.

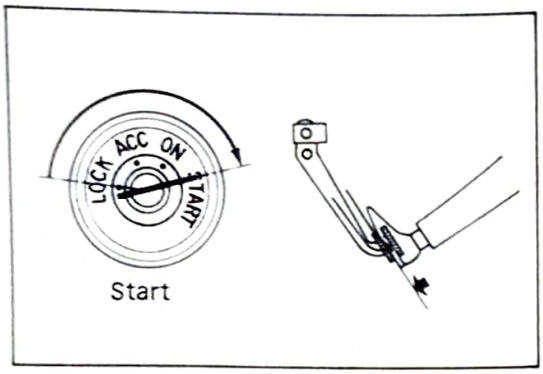


(RN 4 x 4)

(a) Tighten the bellcrank stopper screw until the play of the rear brake links become zero, and then loosen the screw one turn. Tighten the screw lock nut.

(b) Tighten one of the adjusting nuts of the intermediate lever while loosening another one until the travel is correct. Tighten the two adjusting nuts.

(c) After adjusting the parking brake, confirm that the bellcrank stopper screw comes in contact with the backing plate.



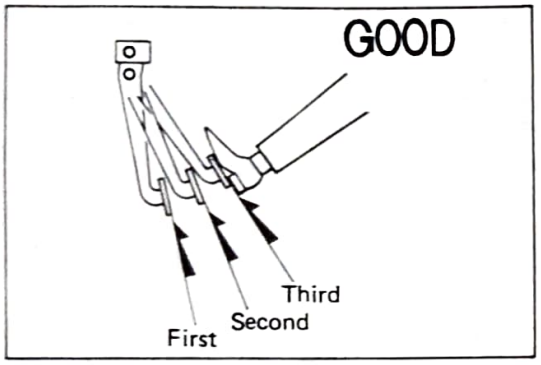
OPERATIONAL TEST OF BRAKE BOOSTER

NOTE: If available, use a brake booster tester to check the booster operating condition.

1. OPERATING CHECK

(a) Depress the brake pedal several times with the engine off, and check that there is no change in the pedal reserve distance.

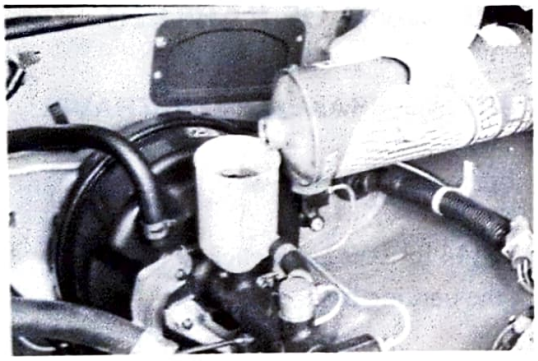
(b) Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.



2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after one or two minutes. Depress the brake pedal several times slowly. If the pedal goes further down the first time, but gradually rises after the second or third times, the booster is air tight.

(b) Depress the brake pedal while the engine is running, and stop it with the pedal depressed. If there is no change in pedal reserve travel after holding the pedal for thirty seconds, the booster is air tight.



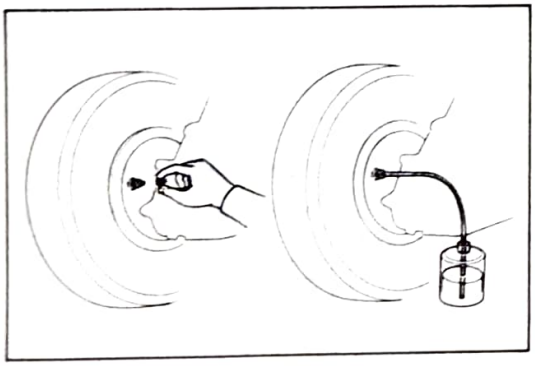
BLEEDING OF BRAKE SYSTEM

NOTE: If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

CAUTION: Do not let brake fluid remain on a painted surface. Wash it off immediately.

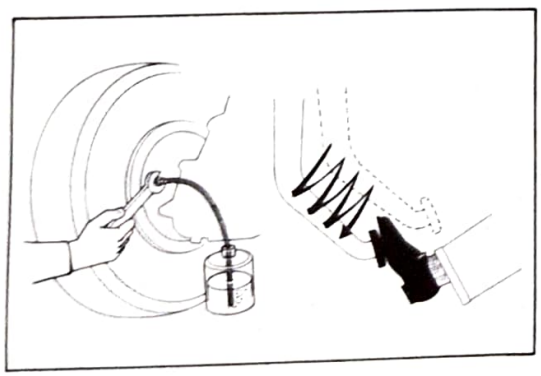
1. FILL BRAKE RESERVOIRS WITH BRAKE FLUID

Check the reservoir after bleeding each wheel. Add fluid, if necessary.



2. CONNECT VINYL TUBE TO WHEEL CYLINDER BLEEDER PLUG

Insert other end of the tube in a half-filled container of brake fluid.



3. BLEED BRAKE LINE

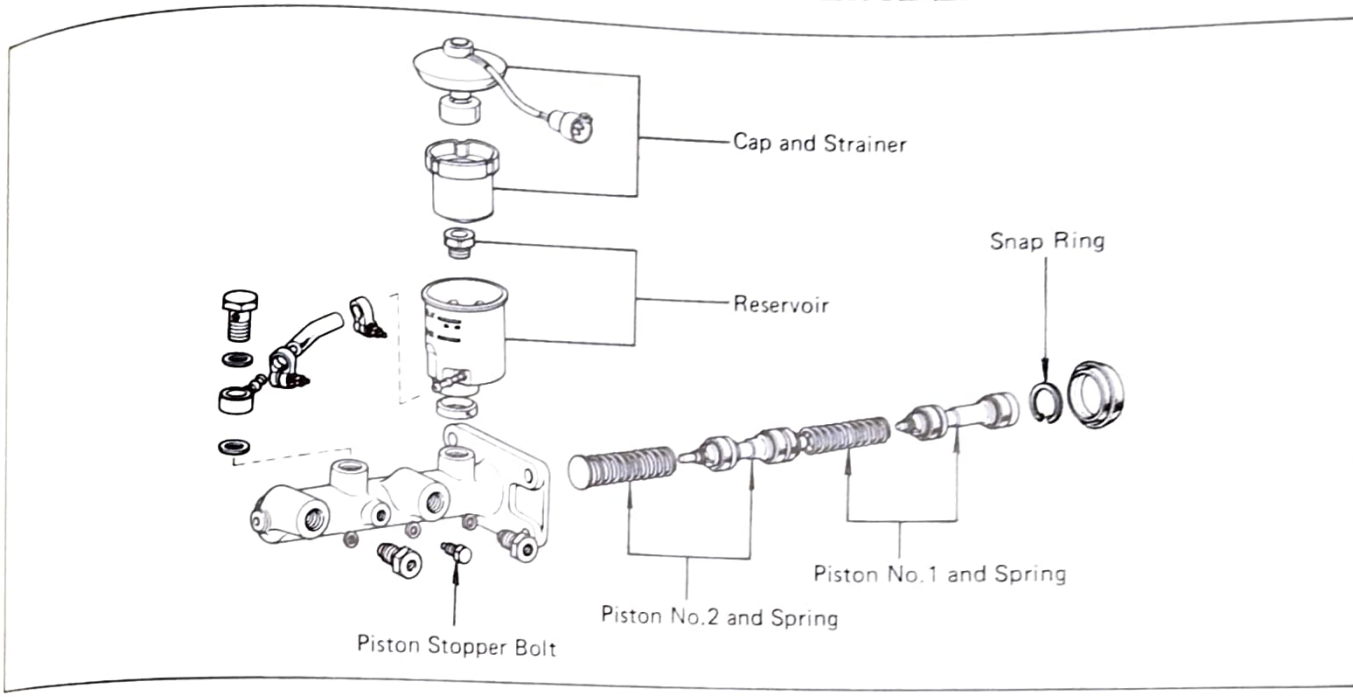
(a) Slowly pump the brake pedal several times.

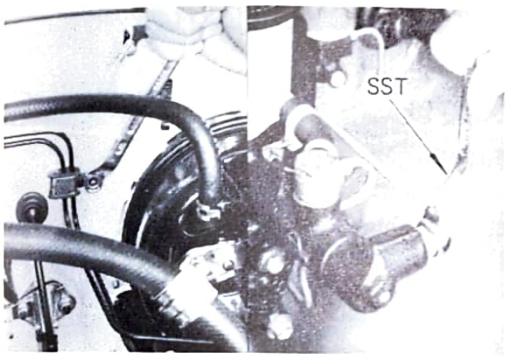
(b) While having an assistant press on the pedal, loosen the bleeder plug until fluid starts to runout. Then close the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.

4. REPEAT PROCEDURE FOR EACH WHEEL

MASTER CYLINDER





REMOVAL OF MASTER CYLINDER

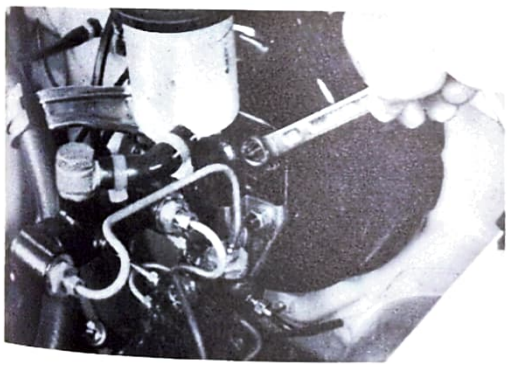
CAUTION: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. REMOVE BRAKE TUBE CLAMP BOLT

2. DISCONNECT TWO BRAKE TUBES

Using a flare nut wrench*, disconnect two brake tubes from the master cylinder.

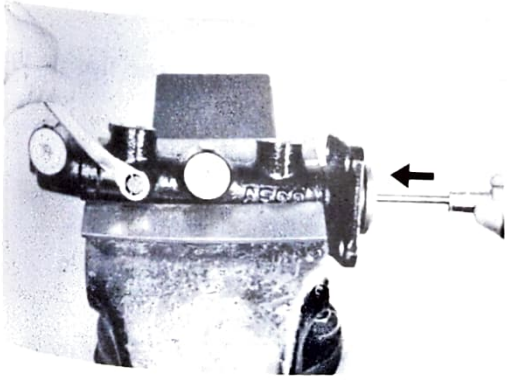
*SST 09751-36011 or Commercial wrench



3. REMOVE MASTER CYLINDER

(a) Remove four nuts.

(b) Remove the master cylinder and gasket from the brake booster.



DISASSEMBLY OF MASTER CLYINDER

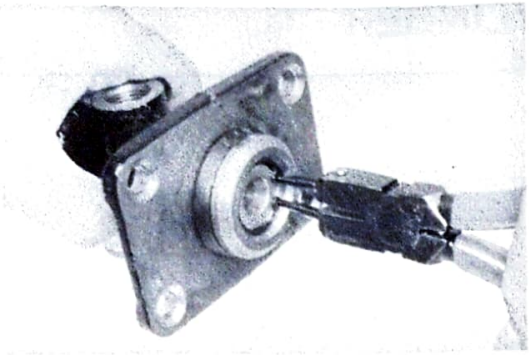
1. REMOVE HOSE AND RESERVOIR

(a) Remove the union bolt from the master cylinder.

(b) Remove the reservoir with hose from the master cylinder.

2. REMOVE PISTON STOPPER BOLT

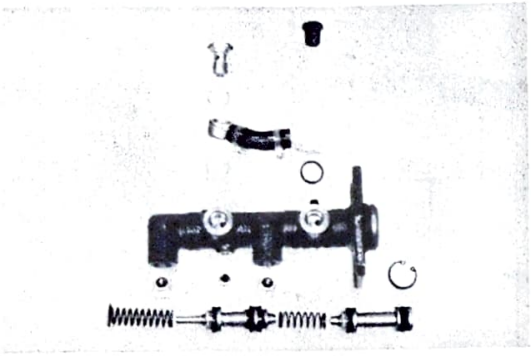
Using a screwdriver, push the pistons in all the way, and remove the piston stopper bolt.



3. REMOVE TWO PISTONS AND SPRINGS
   (a) Using snap ring pliers, remove the snap ring.
   (b) Remove two pistons and springs from the master cylinder.

   NOTE: It may be necessary to inject compressed air in the outlet plug to force out the No.2 piston.

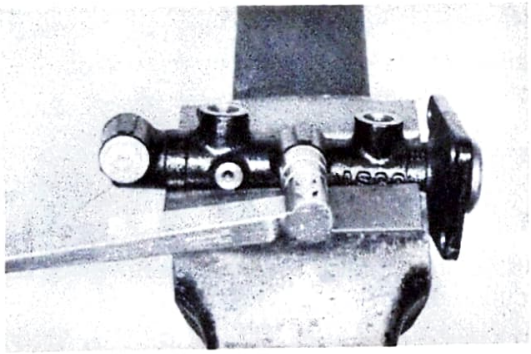
4. REMOVE TWO OUTLET PLUGS



INSPECTION OF MASTER CYLINDER COMPONENTS

1. CLEAN ALL PARTS WITH BRAKE FLUID
2. INSPECT ALL PARTS FOR WEAR OR DAMAGE

   Replace worn or damaged parts as necessary.



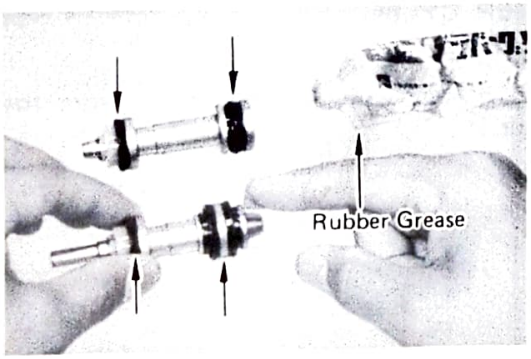
ASSEMBLY OF MASTER CYLINDER
(See illustration on page 15-7)

1. INSTALL TWO OUTLET PLUGS

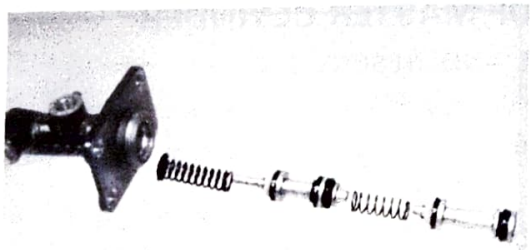
   Torque the outlet plugs.

   Torque:

16 mmϕ	3.5 – 5.5 kg-m (26 – 39 ft-lb)
18 mmϕ	RN C&C rear side 5.3 – 8.4 kg-m (39 – 60 ft-lb)



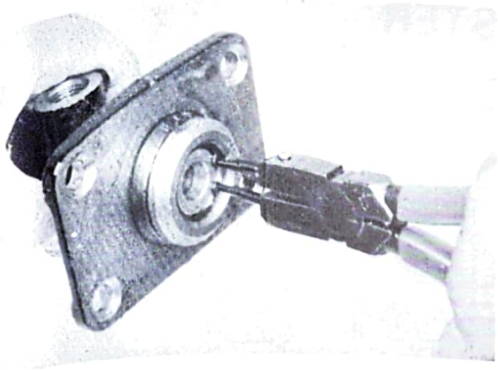
2. APPLY RUBBER GREASE TO RUBBER PARTS OF PISTON



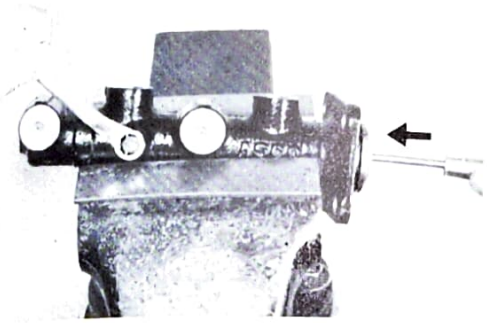
3. INSTALL TWO SPRINGS AND PISTONS

   CAUTION: Be careful not to damage rubber lips on the pistons.

   (a) Insert two springs and pistons in the master cylinder housing, as shown.



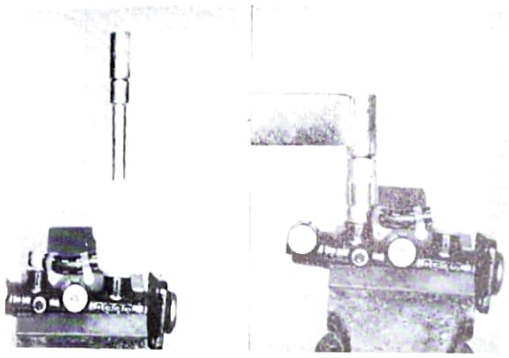
(b) Using snap ring pliers, install the snap ring.



4. INSTALL PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way, and install the piston stopper bolt. Torque the bolt.

Torque: 0.8 – 1.5 kg-m (70 – 130 in.-lb)



5. INSTALL RESERVOIR AND HOSE

(a) Install the reservoir on the master cylinder with MAX mark facing toward the front. Torque the bolts.

Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)

(b) Install the union bolt to the master cylinder. Torque the union bolt.

Torque: 4.0 – 9.0 kg-m (29 – 65 ft-lb)

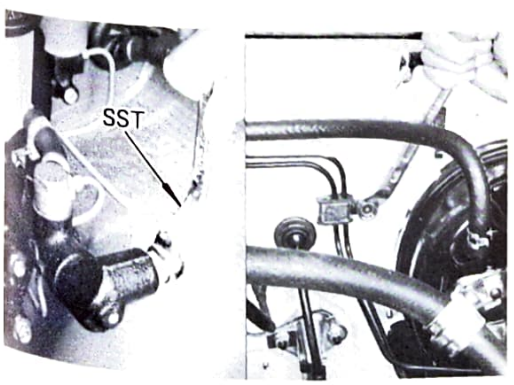
INSTALLATION OF MASTER CYLINDER

1. ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER **(See page 15-13)**

2. INSTALL MASTER CYLINDER

Install the master cylinder and gasket on the brake booster with four nuts. Torque the nuts.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



3. CONNECT TWO BRAKE TUBES

(a) Using a flare nut wrench*, connect two brake tubes to the outlet plugs. Torque the nuts.

Torque: 1.3 – 1.8 kg-m (10 – 13 ft-lb)

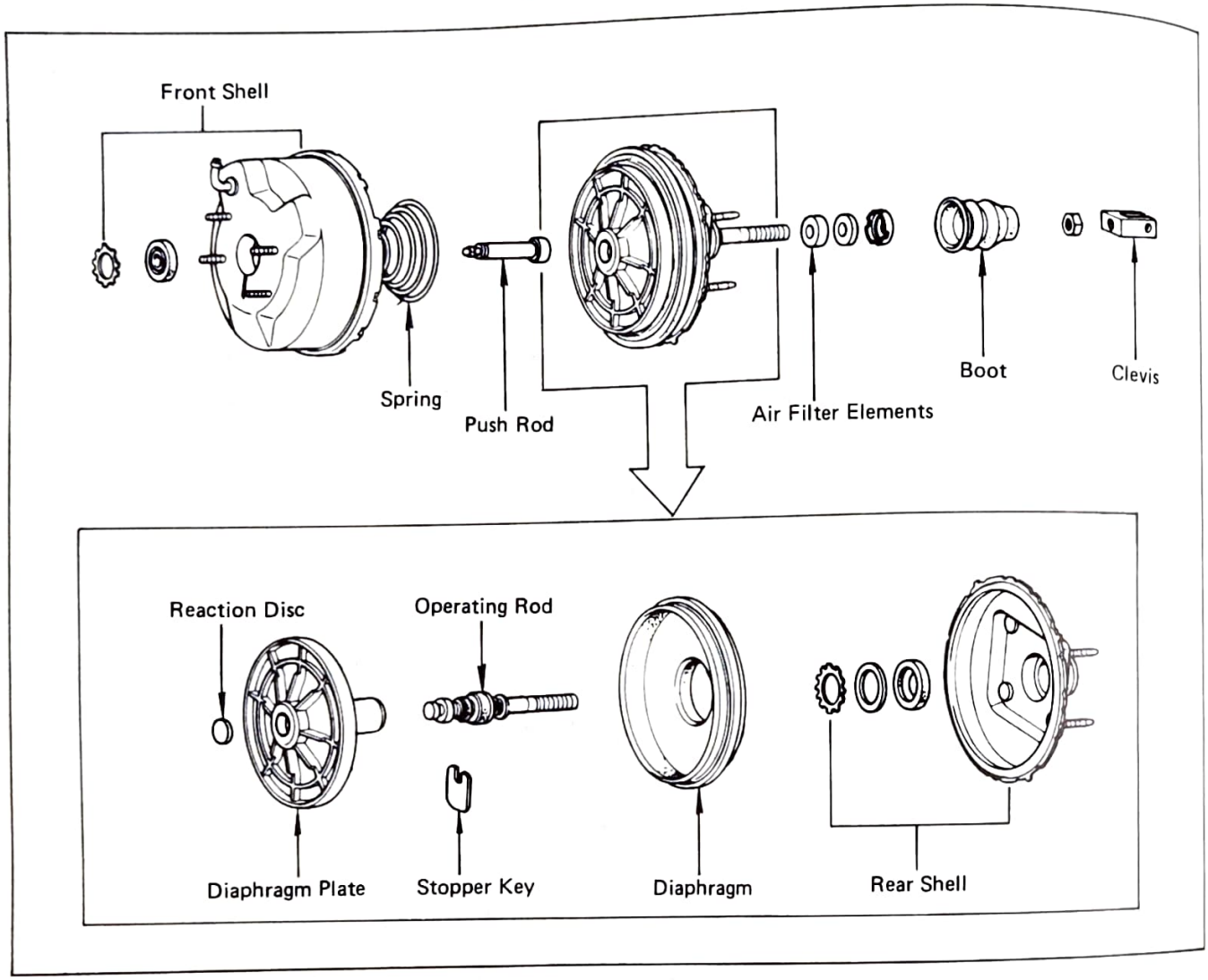
*SST 09751-36011 or Commercial wrench

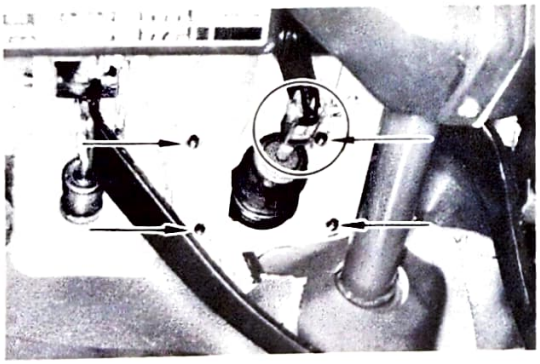
(b) Install the brake tube clamp bolt.

4. ADJUST BRAKE PEDAL **(See page 15-4)**

5. FILL BRAKE RESERVOIRS WITH BRAKE FLUID AND BLEED BRAKE SYSTEM **(See page 15-6)**

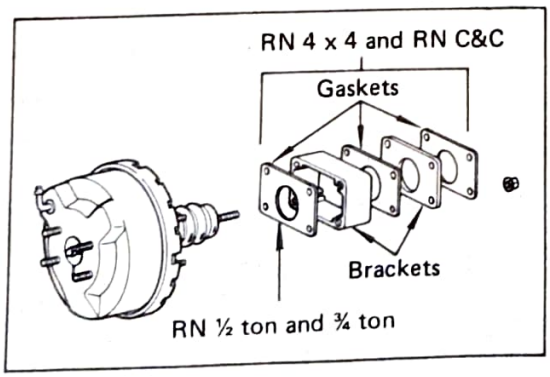
BRAKE BOOSTER



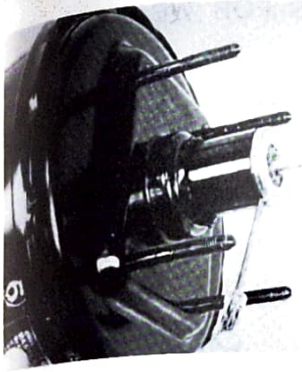


REMOVAL OF BRAKE BOOSTER

1. REMOVE MASTER CYLINDER (See page 15-7)
2. REMOVE CLEVIS PIN FROM BRAKE PEDAL
   Remove clip and clevis pin.
3. DISCONNECT HOSE FROM BRAKE BOOSTER



4. REMOVE BRAKE BOOSTER, BRACKET AND GASKET
   Remove four nuts, and pull out the brake booster.

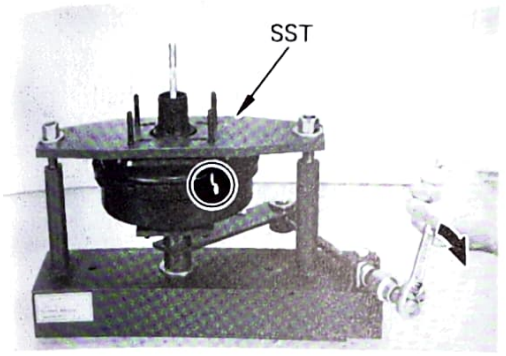


DISASSEMBLY OF BRAKE BOOSTER

1. REMOVE CLEVIS AND BOOT

2. REMOVE AIR FILTER ELEMENTS

Using a screwdriver, remove the retainer and two elements.



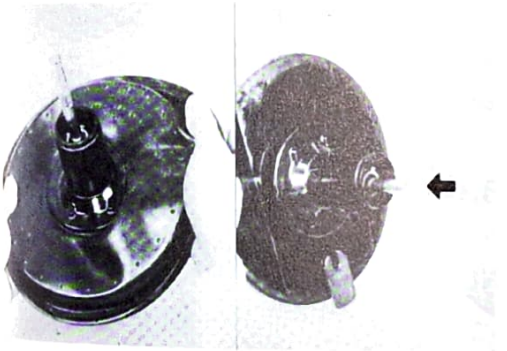
3. SEPARATE FRONT AND REAR SHELLS

(a) Put an alignment mark on the front and rear shell.

(b) Using an overhaul tool*, turn the front shell to separate the front and rear shells.

*SST 09738-00010

(c) Remove the push rod and spring.

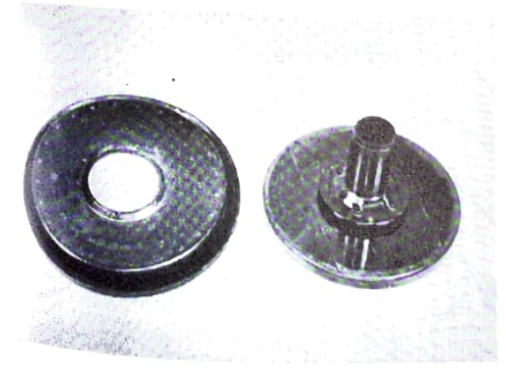


4. REMOVE DIAPHRAGM FROM DIAPHRAGM PLATE

5. REMOVE STOPPER KEY AND VALVE OPERATING ROD

(a) Push the valve operating rod in, and remove the stopper key.

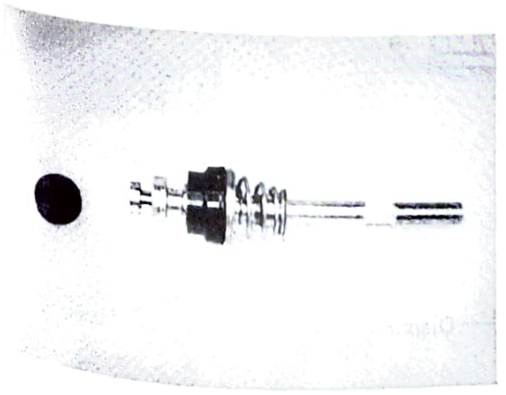
(b) Pull out the valve operating rod.



INSPECTION OF BRAKE BOOSTER COMPONENTS

1. INSPECT DIAPHRAGM AND DIAPHRAGM PLATE FOR WEAR, DAMAGE OR CRACKS

Replace, if necessary.

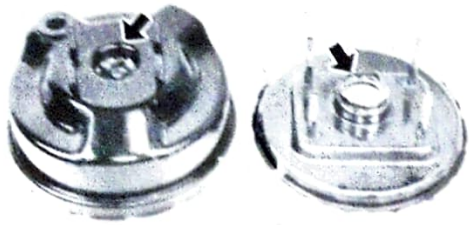


2. INSPECT VALVE OPERATING ROD FOR WEAR OR DAMAGE

Replace, if necessary.

3. INSPECT SHELLS AND SEALS FOR WEAR OR DAMAGE

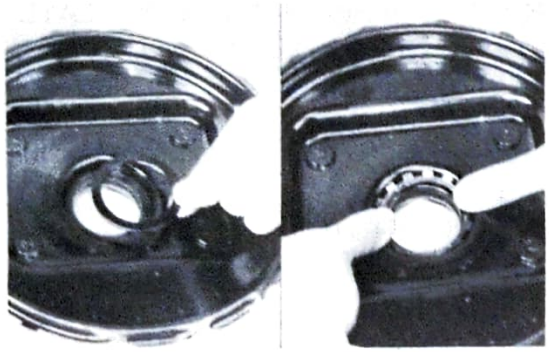
Replace, if necessary.



4. IF NECESSARY, REPLACE SEAL

(a) Using a screwdriver, pry out the retainer.

(b) Remove the plate and seal from the rear shell.



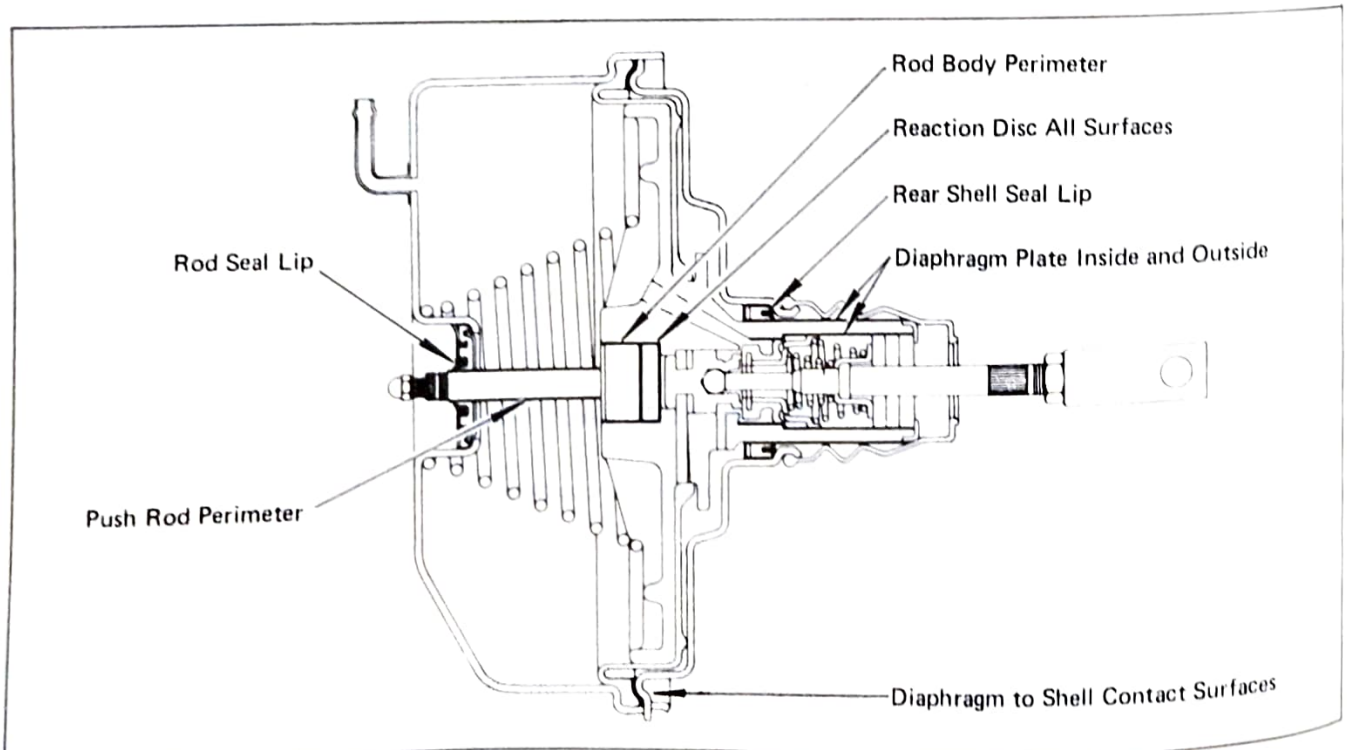
(c) Apply silicon grease to the seal.

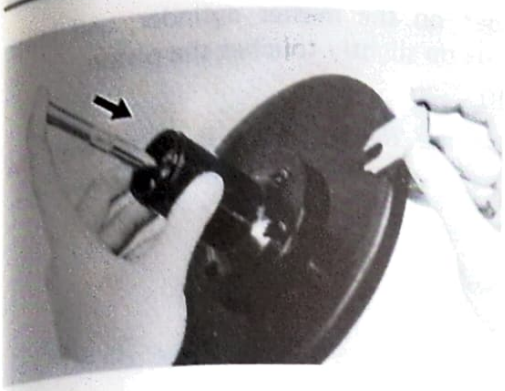
(d) Install the seal and plate to the rear shell.

(e) Secure the seal with the retainer.

ASSEMBLY OF BRAKE BOOSTER
(See illustration on page 15-10)

1. APPLY SILICONE GREASE TO PARTS SHOWN BELOW

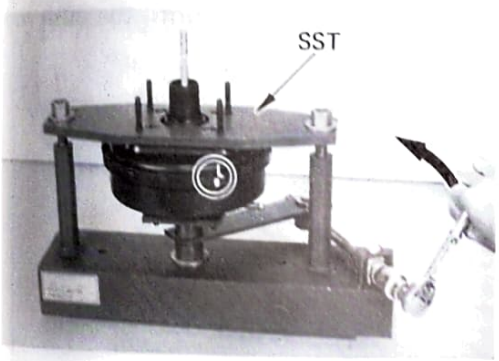




2. INSTALL VALVE OPERATING ROD AND STOPPER KEY
   (a) Insert the valve operating rod in the diaphragm plate.
   (b) Push the valve operating rod in, and install the stopper key.

3. INSTALL DIAPHRAGM ON DIAPHRAGM PLATE

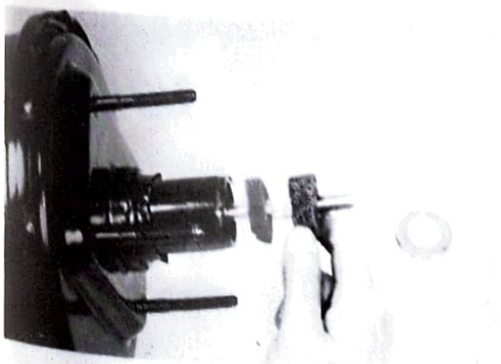
4. ASSEMBLE DIAPHRAGM PLATE AND REAR SHELL



5. ASSEMBLE FRONT AND REAR SHELLS
   (a) Place the spring and push rod in the front shell.
   (b) Using an overhaul tool*, assemble the front and rear shells by turning the front sheel until the alignment marks match.

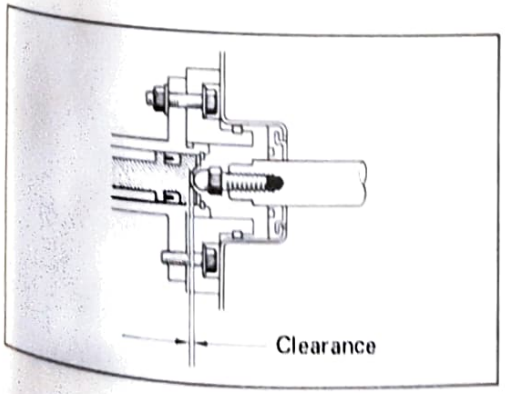
   *SST 09738-00010

   NOTE: If the front shell is too tight to be turned, apply more silicone grease on the diaphragm edge that contacts the front and rear shells.



6. INSTALL AIR FILTER ELEMENTS
   Install two elements and retainer.

7. INSTALL BOOT AND CLEVIS



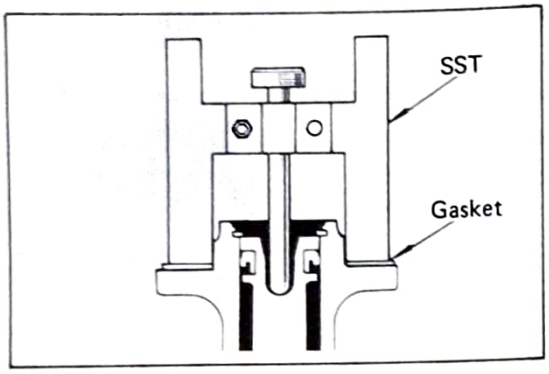
INSTALLATION OF BRAKE BOOSTER
(See illustration on page 15-10)

1. ADJUST LENGTH OF BOOSTER PUSH ROD

   Adjust the length of the booster push rod to provide the specified clearance between the push rod and the master cylinder piston.

   Standard clearance:

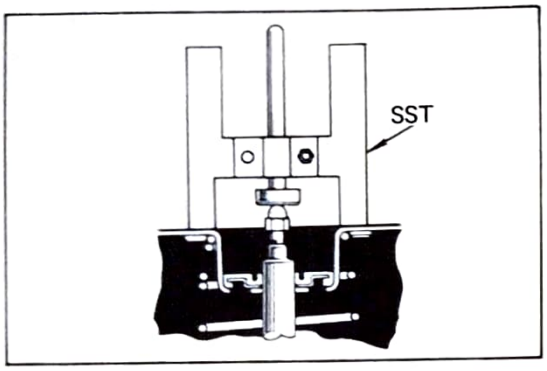
at idling vacuum	**0.1 – 0.5 mm (0.004 – 0.020 in.)**
at no vacuum	**0.60 – 0.65 mm (2.236 – 0.0256 in.)**



(a) Set the gauge* on the master cylinder, and lower the pin until its tip slightly touches the piston.

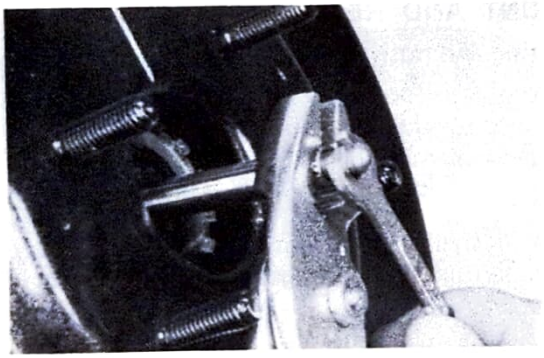
*SST 09737-00010

NOTE: Make sure the measurement is taken with the gasket in place.

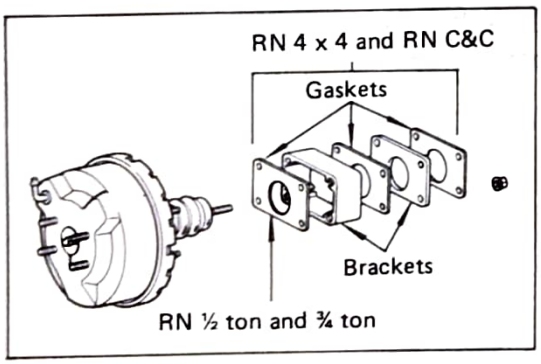


(b) Turn the gauge* upside down, and set it on the booster.

*SST 09737-00010



(c) Adjust the booster push rod length until the push rod lightly touches the pin head.



2. **INSTALL BRAKE BOOSTER, BRACKET AND GASKET**

   Tighten the booster mounting nuts.

   Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

3. **INSTALL MASTER CYLINDER** **(See steps 2 and 3, page 15-9)**

4. **CONNECT HOSE TO BRAKE BOOSTER**

5. **CONNECT CLEVIS TO BRAKE PEDAL**

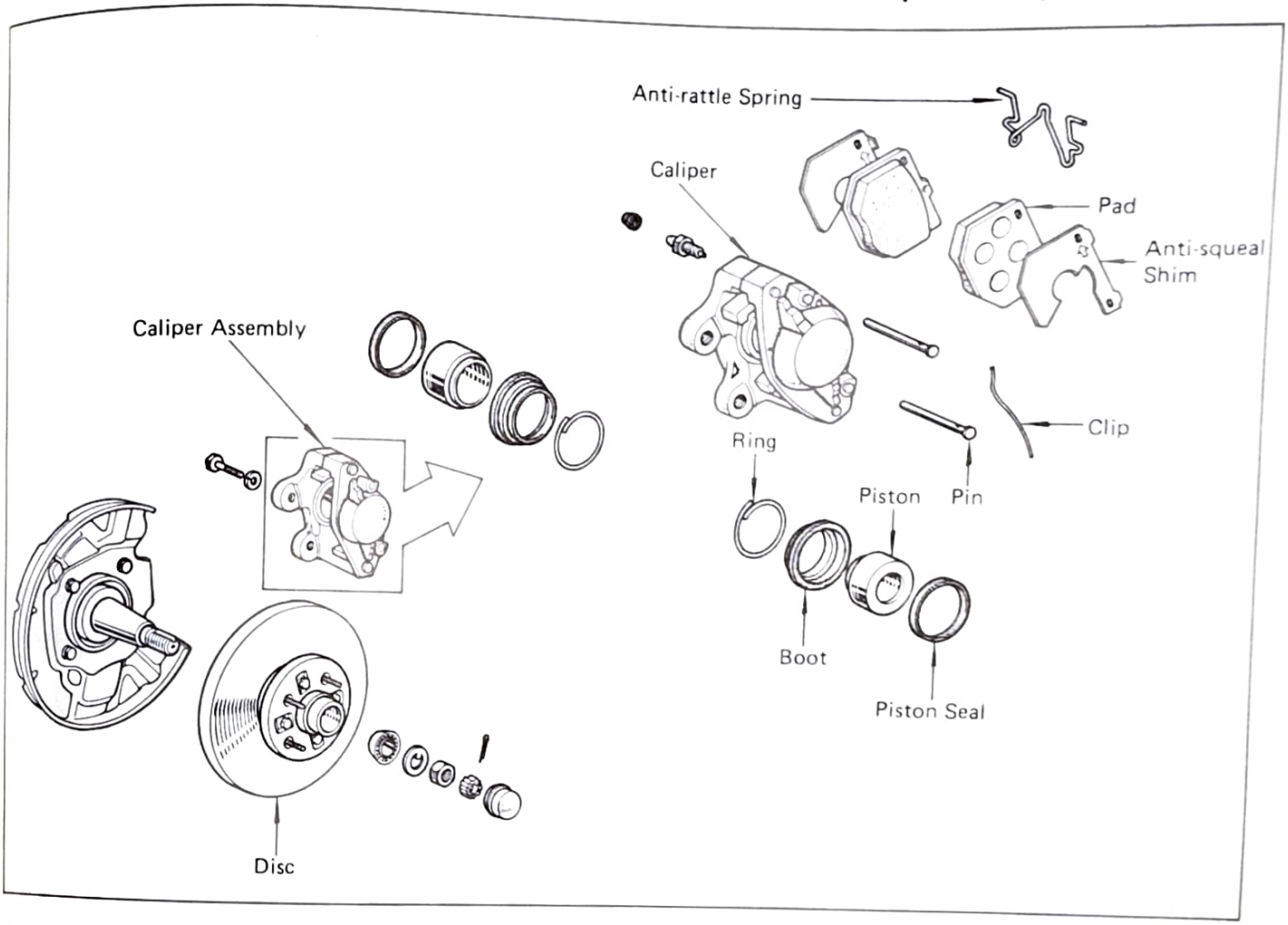
   Install clevis pin and clip.

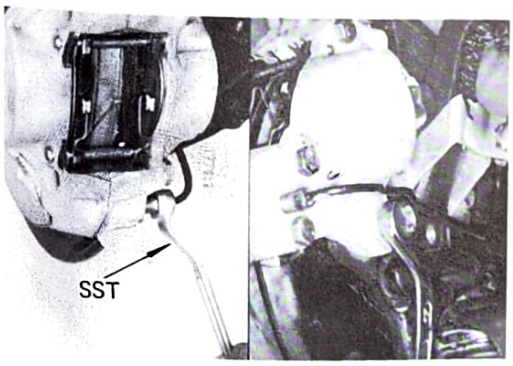
6. **ADJUST BRAKE PEDAL** **(See page 15-4)**

7. **BLEED BRAKE SYSTEM** **(See page 15-6)**

8. **PERFORM OPERATIONAL CHECK** *(See page 15-6)*

FRONT BRAKE
S-16 Type Disc Brake
(RN 1/2 ton, RN 3/4 ton)





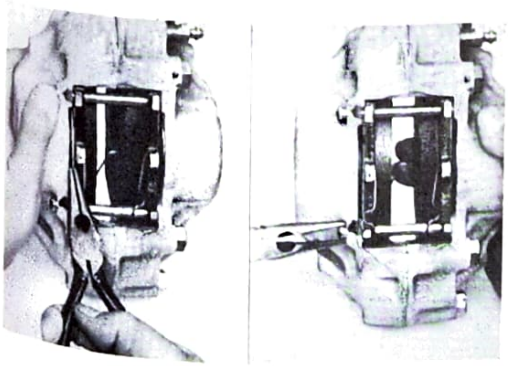
REMOVAL AND DISASSEMBLY OF BRAKE CALIPER

1. REMOVE CALIPER

If only the brake pads are to be replaced, do not remove the caliper.

If repairing the caliper, disconnect the brake line using a flare nut wrench*. Use a container to catch the brake fluid.

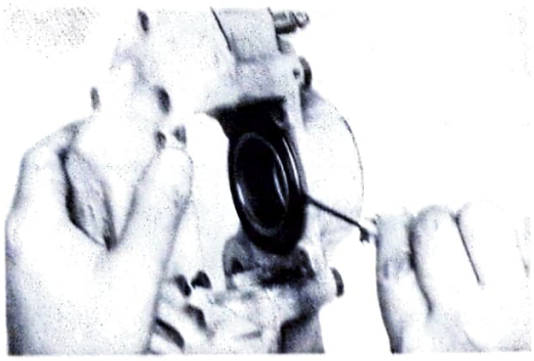
*SST 09751-36011 or Commercial wrench



2. REMOVE BRAKE PADS

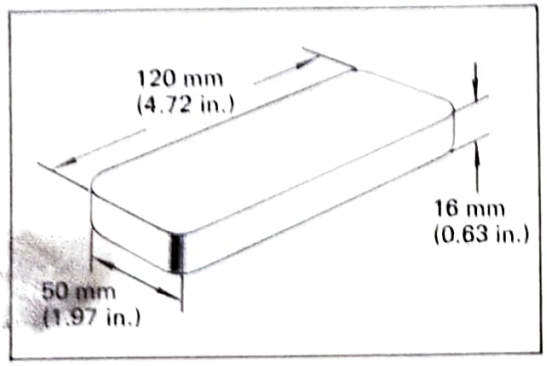
Remove the following parts from the caliper:

(a) Clip
(b) Two pins
(c) Antirattle spring
(d) Two pads and shims



3. REMOVE BOOT

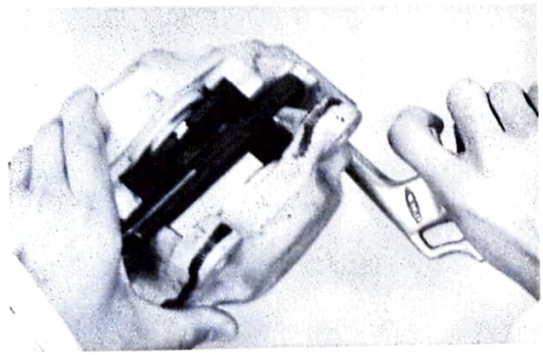
Using a screwdriver, remove the set ring and boot.



4. REMOVE PISTON FROM CALIPER

(a) Prepare the wooden plate to hold the piston shown in the figure.

(b) Place the plate into the caliper slot and insert a pad at one side.

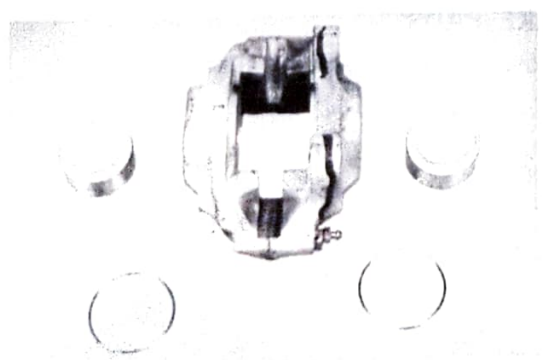


(c) Using compressed air, remove the pistons alternately from the caliper.

WARNING: Do not place your fingers in front of the piston when using compressed air.

5. REMOVE PISTON SEAL

Using a screwdriver, remove the seal from the caliper.

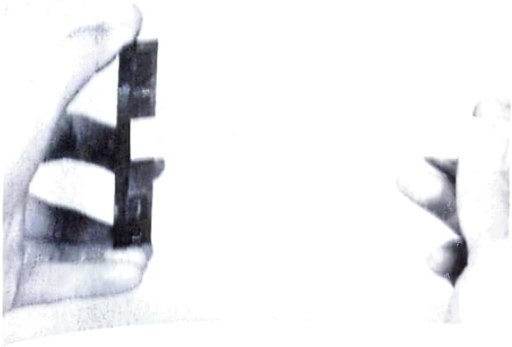


INSPECTION OF FRONT BRAKE COMPONENTS

1. WASH PISTON AND CALIPER WITH BRAKE FLUID

2. INSPECT PARTS FOR WEAR, DAMAGE OR CORROSION

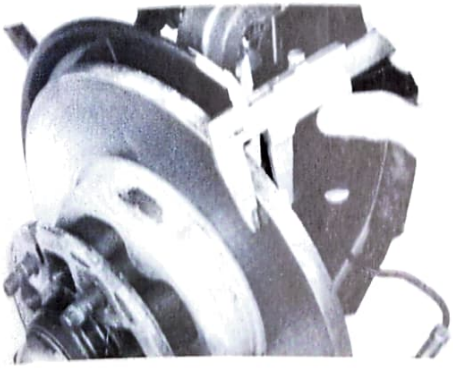
Replace the parts as necessary.



3. MEASURE PAD LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)

If the pads are less than minimum or show signs of uneven wear, replace the pad.



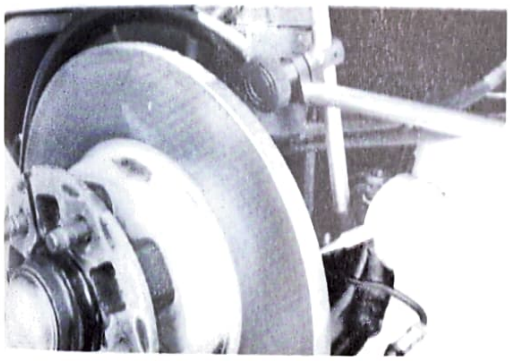
4. MEASURE DISC THICKNESS

Minimum thickness: 11.5 mm (0.453 in.)
Standard thickness: 12.5 mm (0.492 in.)

If the disc thickness is less than minimum, replace the disc.

5. CHECK LINING CONTACT SURFACE FOR SCORING

Repair or replace the disc as necessary.

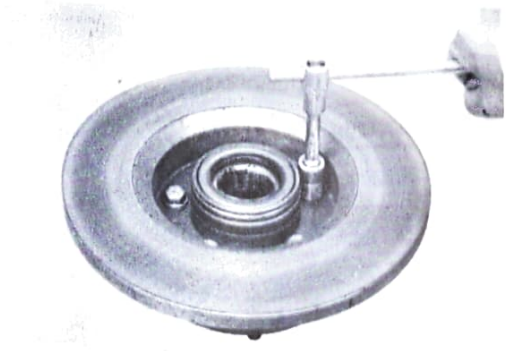


6. MEASURE DISC RUNOUT

Maximum disc runout: 0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc.

NOTE: Make sure the front bearing is adjusted correctly before measuring the runout.



7. IF NECESSARY, REPLACE DISC

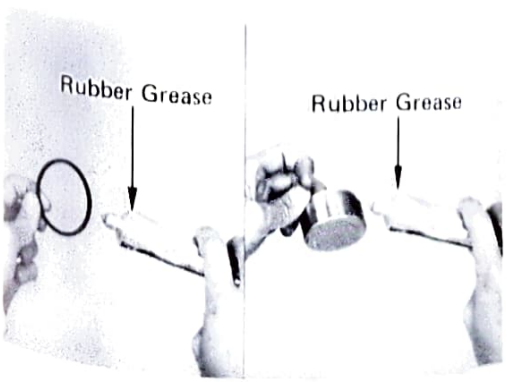
(a) Remove the axle hub. (See page 13-7)

(b) Remove the disc from the axle hub.

(c) Install a new disc. Torque five bolts.

Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)

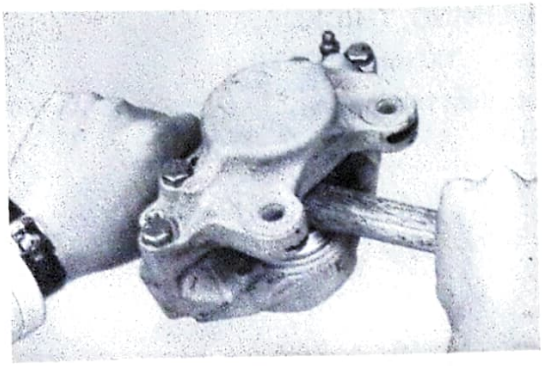
(d) Install the axle hub and adjust the front bearing preload. (See page 13-8)



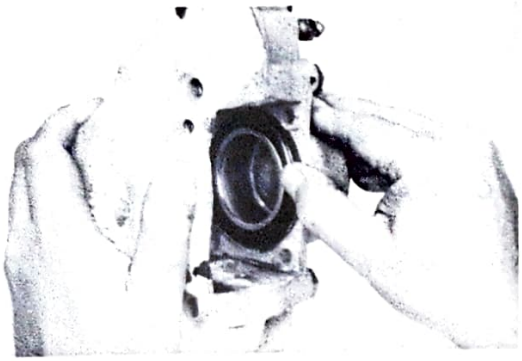
ASSEMBLY AND INSTALLATION OF BRAKE CALIPER

(See illustration on page 15-15)

1. APPLY RUBBER GREASE TO PISTON SEAL AND PISTON

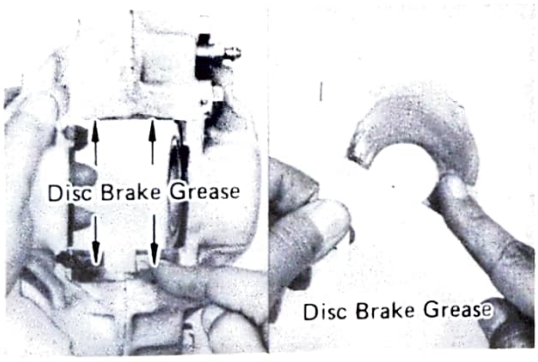


2. INSTALL PISTON SEAL AND PISTON IN CALIPER

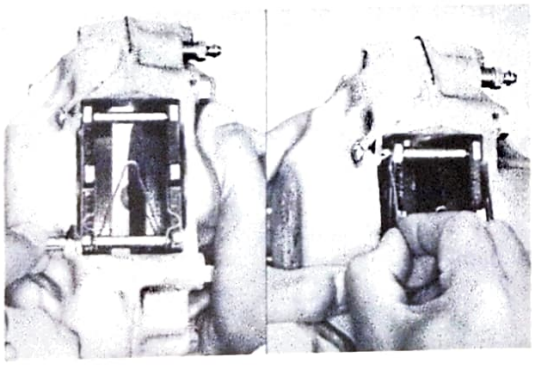


3. INSTALL BOOT IN CALIPER

Install the boot with a set ring.



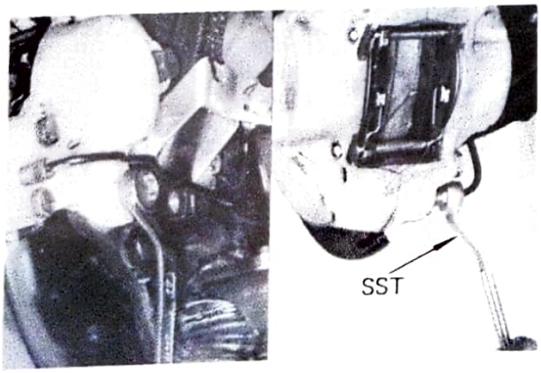
4. APPLY DISC BRAKE GREASE TO ANTISQUEAL SHIMS AND CALIPER



5. INSTALL BRAKE PADS

Install the following parts to the caliper:

(a) Two pads and shims
(b) Antirattle spring
(c) Two pins
(d) Clip



6. INSTALL CALIPER

(a) Install the brake caliper, and torque the mounting bolts.

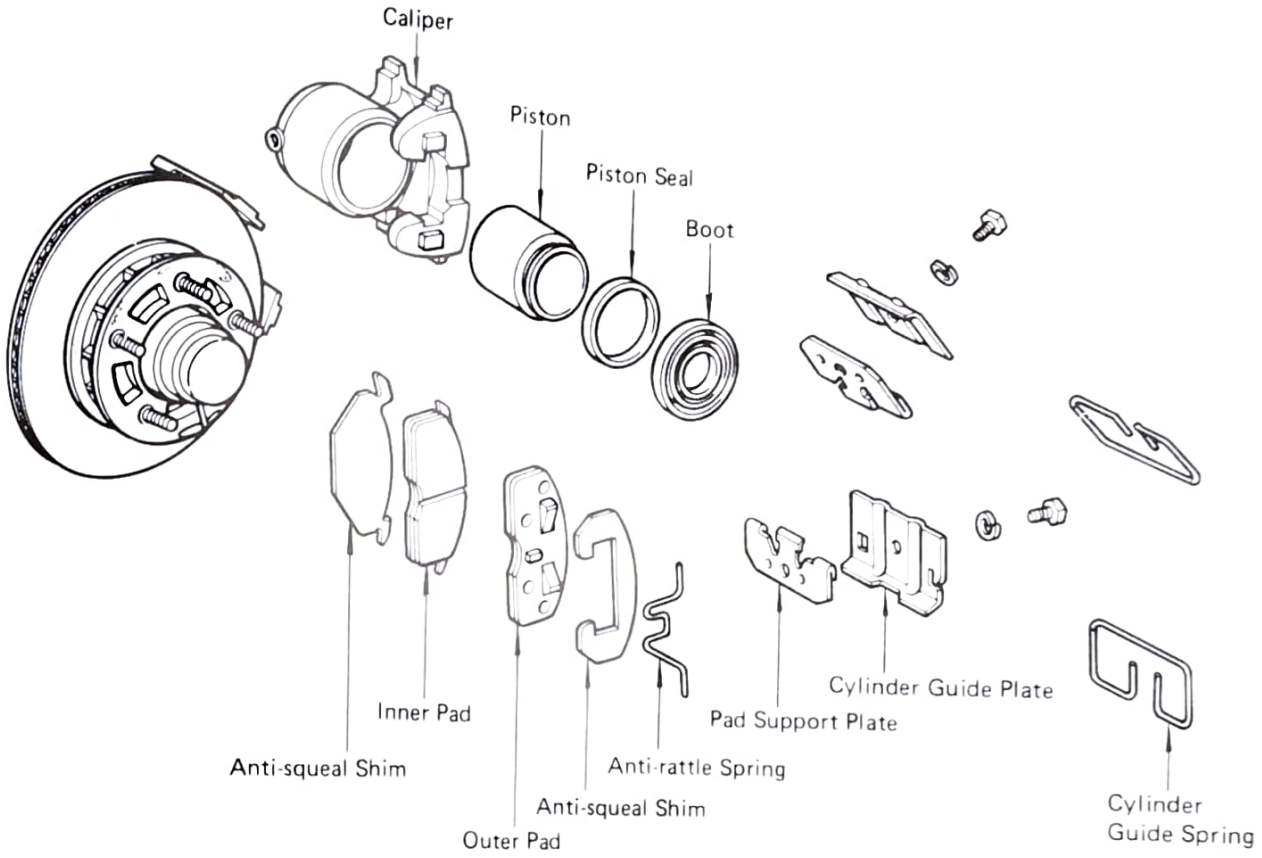
Torque: 9.3 – 12.0 kg-m (68 – 86 ft-lb)

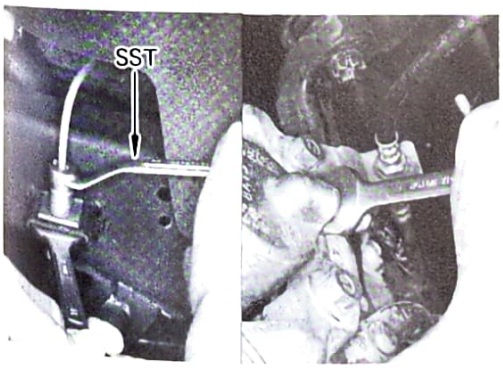
(b) Using a flare nut wrench*, connect the brake line.

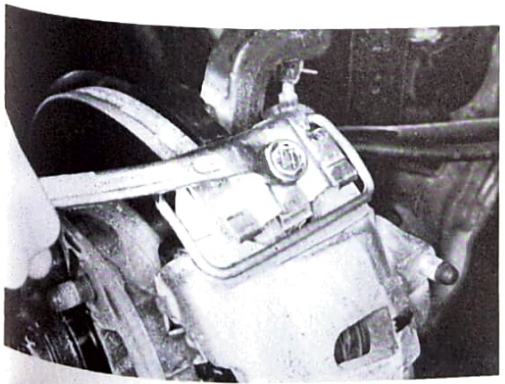
*SST 09751-36011 or Commercial wrench

Torque: 1.3 – 1.8 kg-m (10 – 13 ft-lb)

K Type Disc Brake (RN C&C)







REMOVAL AND DISASSEMBLY OF BRAKE CALIPER

1. REMOVE BRAKE HOSE

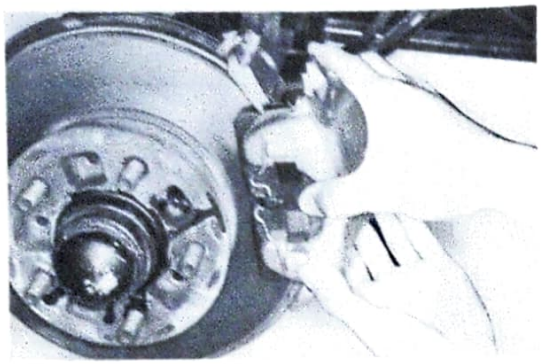
   If only the brake pads are to be replaced, do not disconnect the brake line.

   If repairing the cylinder, disconnect the brake line using a flare nut wrench*. Use a container to catch the brake fluid.

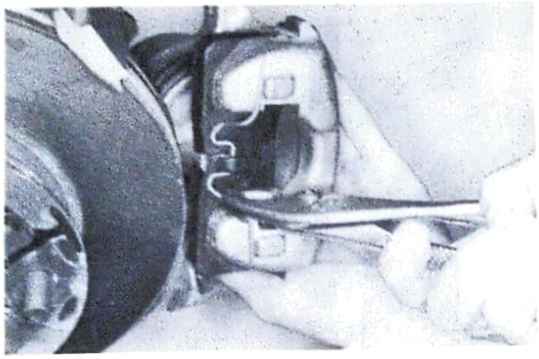
   *SST 09751-36011 or Commercial wrench

2. REMOVE CALIPER

   (a) Remove the cylinder guide plates, cylinder support springs and pad support plates.



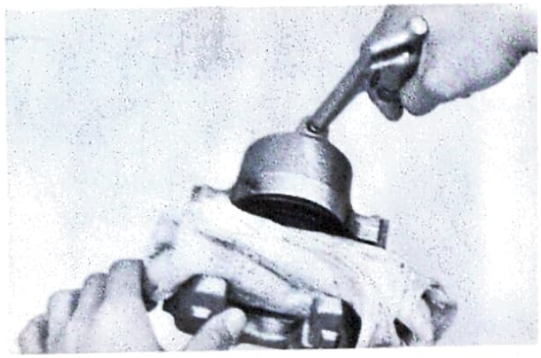
(b) Remove the cylinder with the outer pad from the disk brake mounting.



3. REMOVE BRAKE PADS

(a) Remove the anti-rattle spring and outer pad from the caliper.

(b) Remove the inner pad from the disc brake mounting.



4. REMOVE PISTON FROM CYLINDER

(a) Put a piece of cloth or such between the piston and caliper.

(b) Using compressed air, remove the piston from the caliper.

WARNING: Do not place your fingers in front of the piston when using compressed air.

5. REMOVE PISTON SEAL

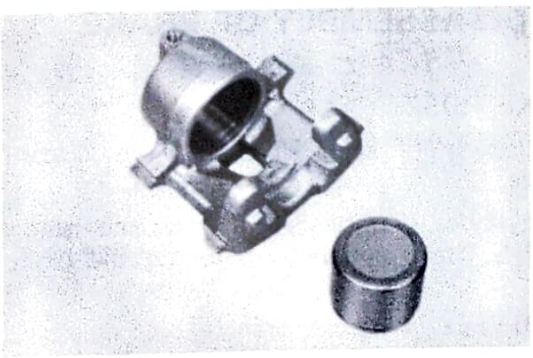
Using a screwdriver, remove the seal from the caliper.

INSPECTION OF FRONT BRAKE COMPONENTS

1. WASH PISTON AND CALIPER WITH BRAKE FLUID

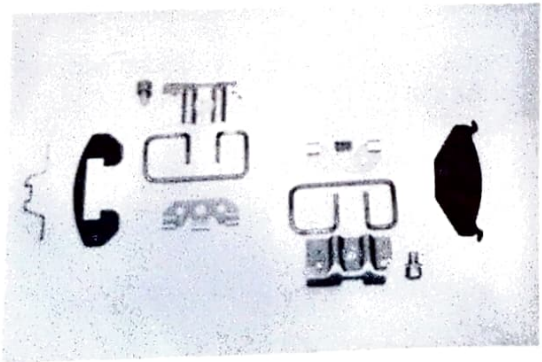
2. INSPECT CALIPER AND PISTON FOR WEAR, DAMAGE OR CORROSION

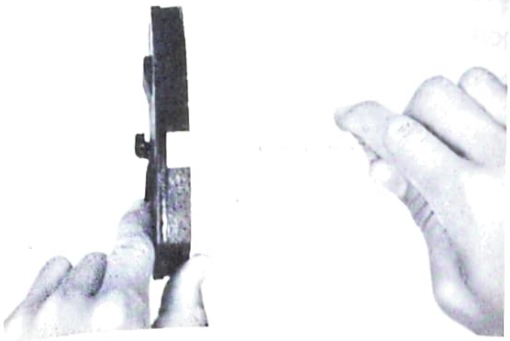
Replace the parts as necessary.



3. INSPECT PARTS FOR DAMAGE OR WEAKENESS

Replace the parts as necessary.

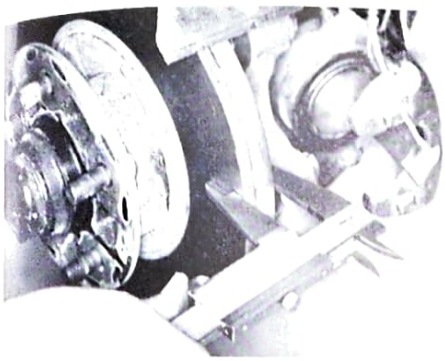




4. MEASURE PAD LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)

If the pads are less than minimum or show signs of uneven wear, replace the pad.



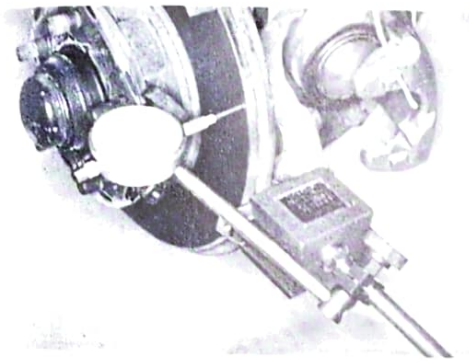
5. MEASURE DISC THICKNESS

Minimum thickness: 19.0 mm (0.748 in.)
Standard thickness: 20.0 mm (0.787 in.)

If the disc thickness is less than minimum, replace the disc.

6. CHECK LINING CONTACT SURFACE FOR SCORING

Repair or replace the disc as necessary.

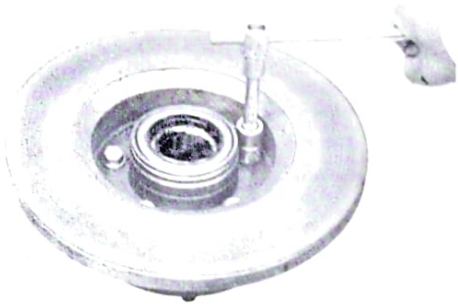


7. MEASURE DISC RUNOUT

Maximum disc runout: 0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc.

NOTE: Make sure the front bearing is adjusted correctly before measuring the runout.



8. IF NECESSARY, REPLACE DISC

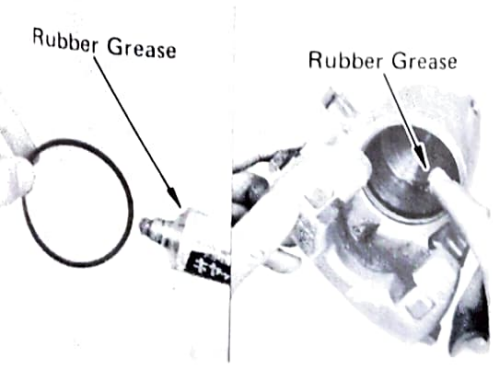
(a) Remove the axle hub. (See page 13-7)

(b) Remove the disc from the axle hub.

(c) Install a new disc. Torque five bolts.

Torque: 5.5 – 7.5 kg-m (40 – 54 ft-lb)

(d) Install the axle hub and adjust the front bearing preload. (See page 13-8)

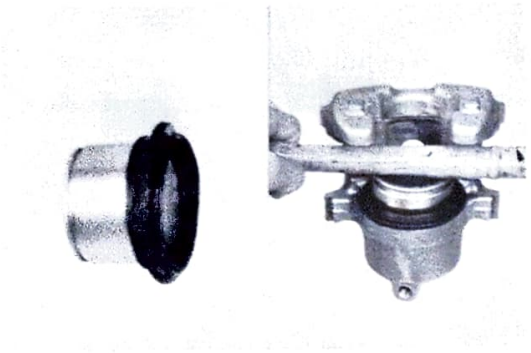


ASSEMBLY AND INSTALLATION OF BRAKE CALIPER

(See illustration on page 15-19)

1. APPLY RUBBER GREASE TO PISTON SEAL AND CALIPER

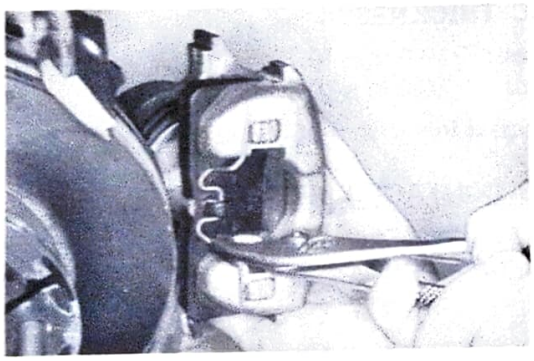
2. INSTALL PISTON SEAL IN CALIPER



3. INSTALL PISTON IN CALIPER

(a) Install the boot on the piston.

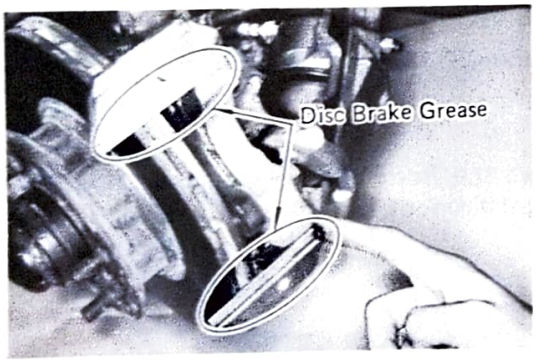
(b) Assemble the piston to the caliper after the boot.



4. INSTALL BRAKE PADS

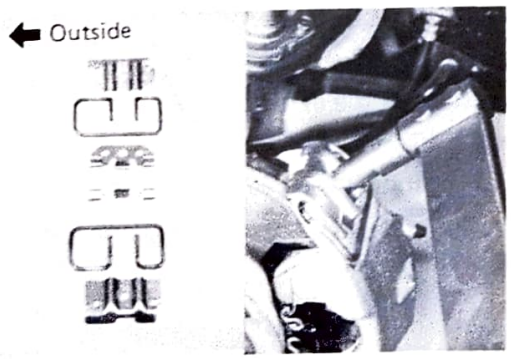
(a) Install the outer pad and anti-rattle spring to the caliper.

(b) Install the inner pad to the disc brake mounting.



5. INSTALL CALIPER

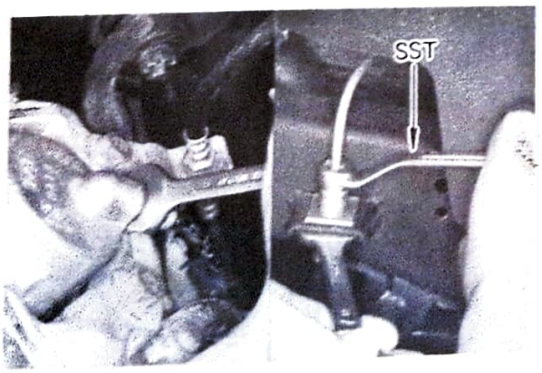
(a) Apply disc brake grease to the rubbing parts of the caliper.



(b) Install the caliper with the outer pad over the inner pad.

(c) Install the pad support plates, cylinder support springs and cylinder guide plates. Torque the bolts.

Torque: 4.0 – 6.0 kg-m (29 – 44 ft-lb)



6. INSTALL BRAKE HOSE

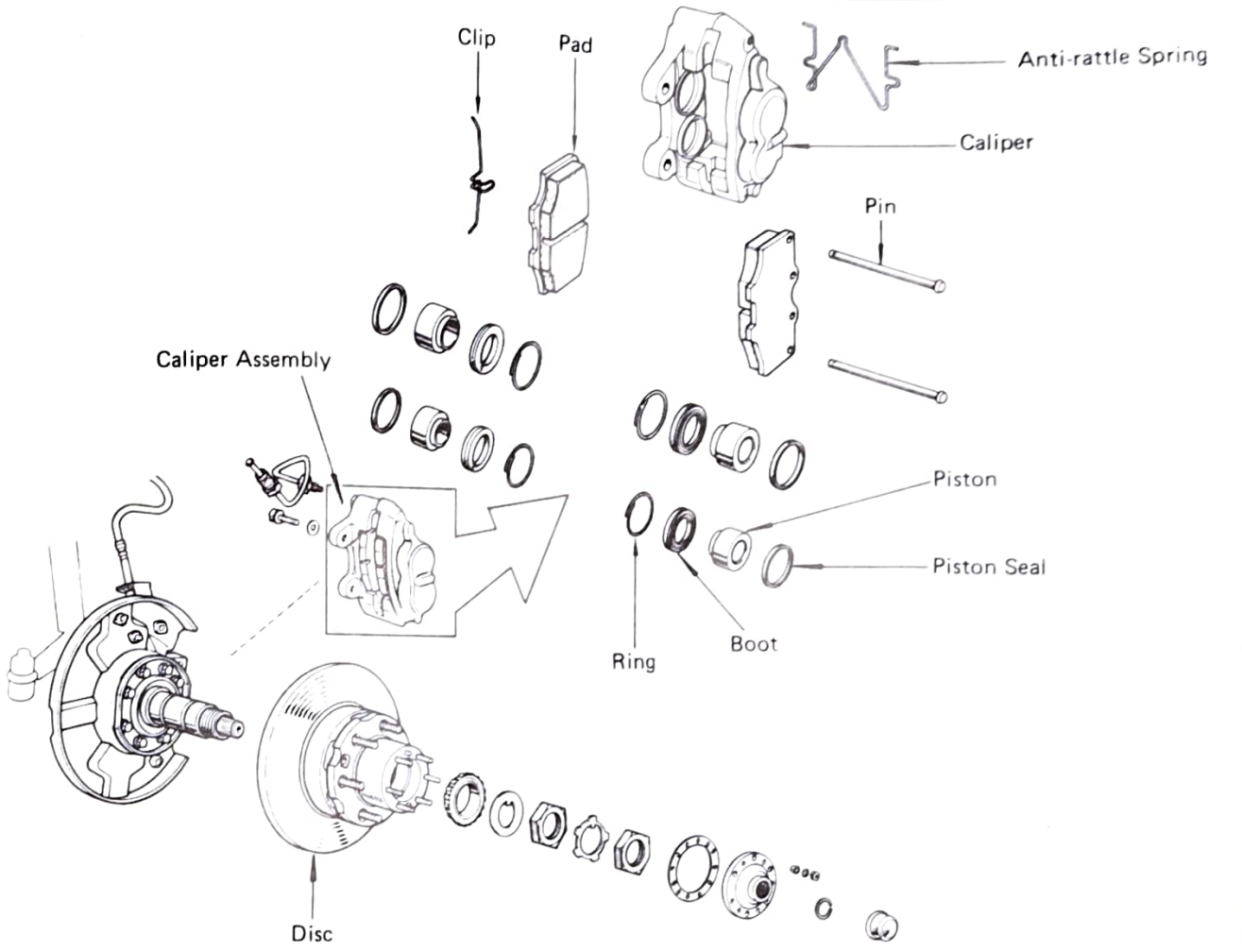
Connect the caliper side of the hose and then, using a flare nut wrench*, connect the tube side.

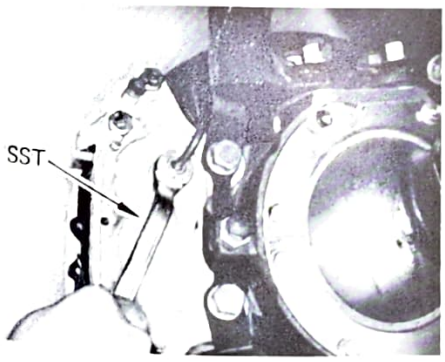
*SST 09751-36011 or Commercial wrench

Torque:

Caliper side	2.0 – 2.7 kg-m (15 – 19 ft-lb)
Tube side	1.3 – 1.8 kg-m (10 – 13 ft-lb)

S-12+8 Type Disc Brake (RN 4×4)





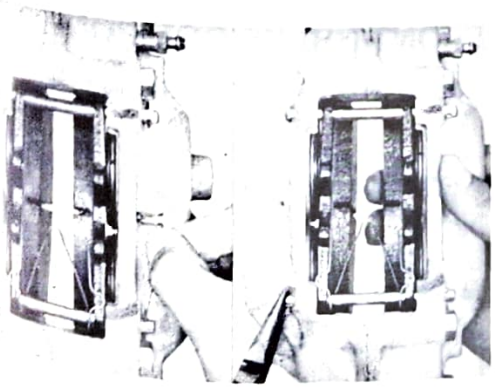
REMOVAL AND DISASSEMBLY OF BRAKE CYLINDER

1. REMOVE CYLINDER

If only the brake pads are to be replaced, do not remove the caliper.

If repairing the cylinder, disconnect the brake line using a flare nut wrench*. Use a container to catch the brake fluid.

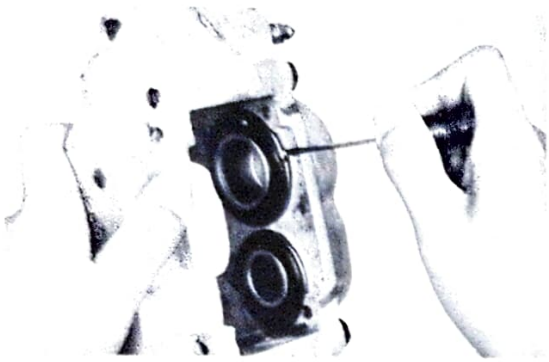
*SST 09751-36011 or Commercial wrench



2. REMOVE BRAKE PADS

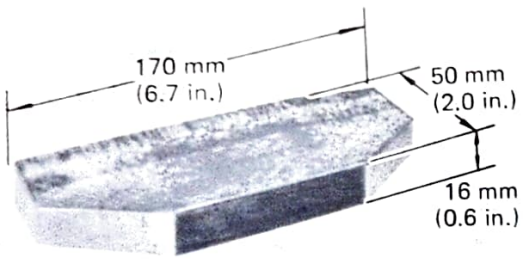
Remove the following parts from the caliper:

(a) Clip
(b) Two pins
(c) Anti-rattle spring
(d) Two pads



3. REMOVE BOOT

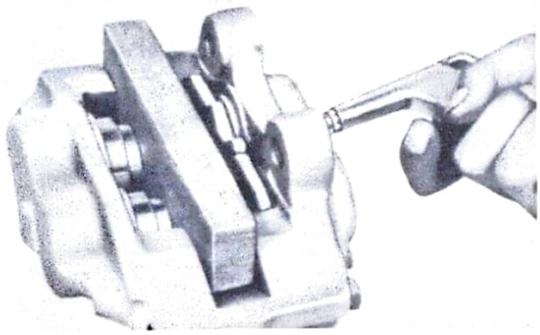
Using a screwdriver, remove the set ring and boot.



4. REMOVE PISTON FROM CALIPER

(a) Prepare the wooden plate as shown in the figure, to hold the piston.

(b) Place the plate into the caliper slot and insert a pad at one side.



(c) Use compressed air to remove the pistons alternately from the caliper.

WARNING: Do not place your fingers in front of the piston when using compressed air.

5. REMOVE PISTON SEAL

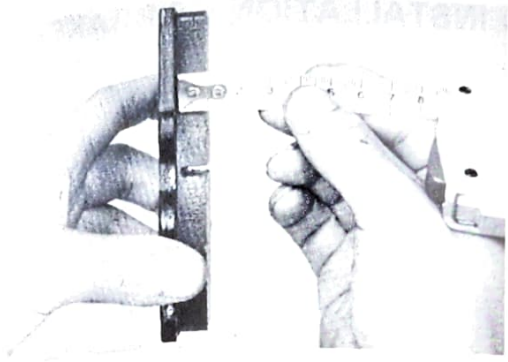
Using a screwdriver, remove the seal from the caliper.

INSPECTION OF FRONT BRAKE COMPONENTS

1. WASH PISTON AND CALIPER WITH BRAKE FLUID

2. INSPECT PARTS FOR WEAR, DAMAGE OR CORROSION

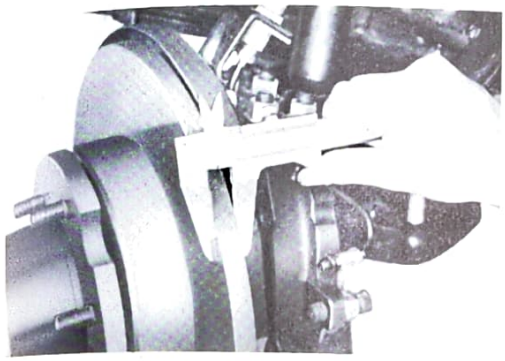
Replace the parts as necessary.



3. MEASURE PAD LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)

If the pads are less than minimum or show signs of uneven wear, replace the pad.



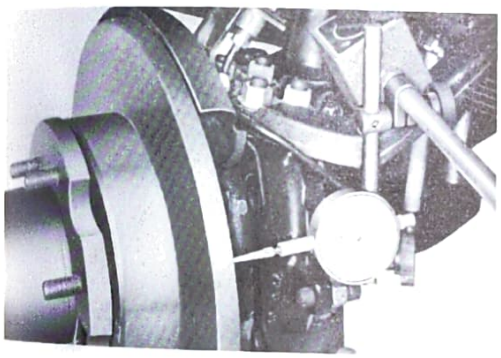
4. MEASURE DISC THICKNESS

Minimum thickness: 11.5 mm (0.453 in.)
Standard thickness: 12.5 mm (0.492 in.)

If the disc thickness is less than minimum, replace the disc.

5. CHECK LINING CONTACT SURFACE FOR SCORING

Repair or replace the disc as necessary.

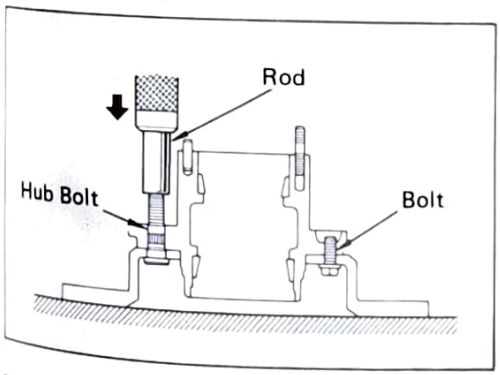


6. MEASURE DISC RUNOUT

Maximum disc runout: 0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc.

NOTE: Make sure the front bearing is adjusted correctly before measuring the runout.

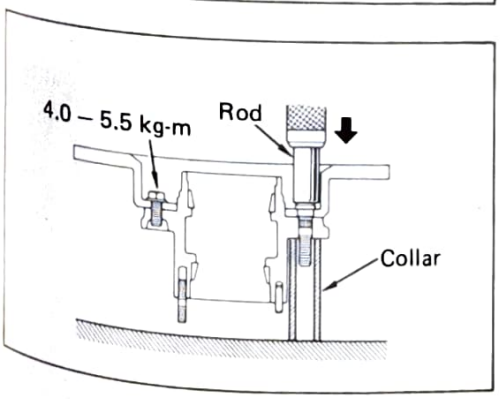


7. IF NECESSARY, REPLACE DISC

(a) Remove the axle hub. (See page 13-36)

(b) Using a rod, press the hub bolts out of the axle hub.

(c) Remove the two bolts and separate the disc and hub.



(d) Install a new disc to the axle hub and tighten the two bolts.

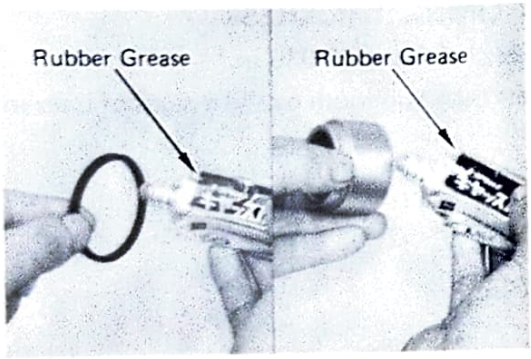
Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)

(e) Using a collar and rod, press the hub bolts into the hub.

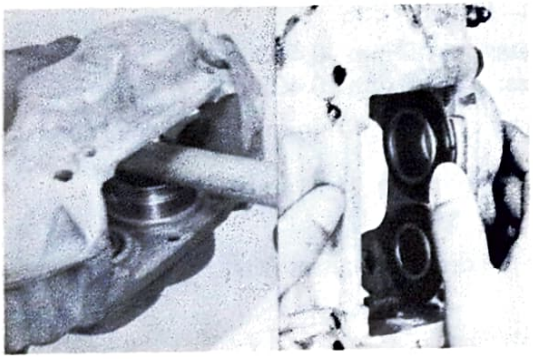
(f) Install the axle hub and adjust the front bearing preload. (See page 13-38)

ASSEMBLY AND INSTALLATION OF BRAKE CALIPER

(See illustration on page 15-23)



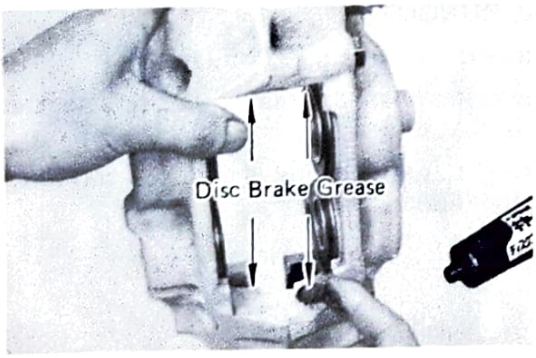
1. APPLY RUBBER GREASE TO PISTON SEAL AND PISTON



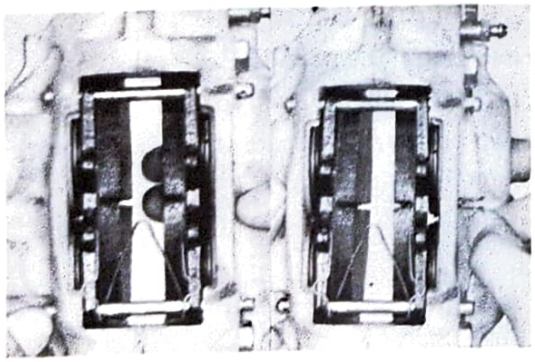
2. INSTALL PISTON SEAL AND PISTON IN CALIPER

3. INSTALL BOOT IN CALIPER

Install the boot with a set ring.



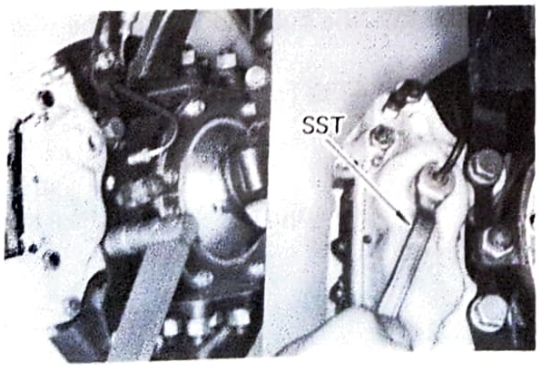
4. APPLY DISC BRAKE GREASE TO CALIPER



5. INSTALL BRAKE PADS

Install the following parts to the caliper:

(a) Two pads
(b) Anti-rattle spring
(c) Two pins
(d) Clip



6. INSTALL CALIPER

(a) Install the brake caliper, and torque the mounting bolts.

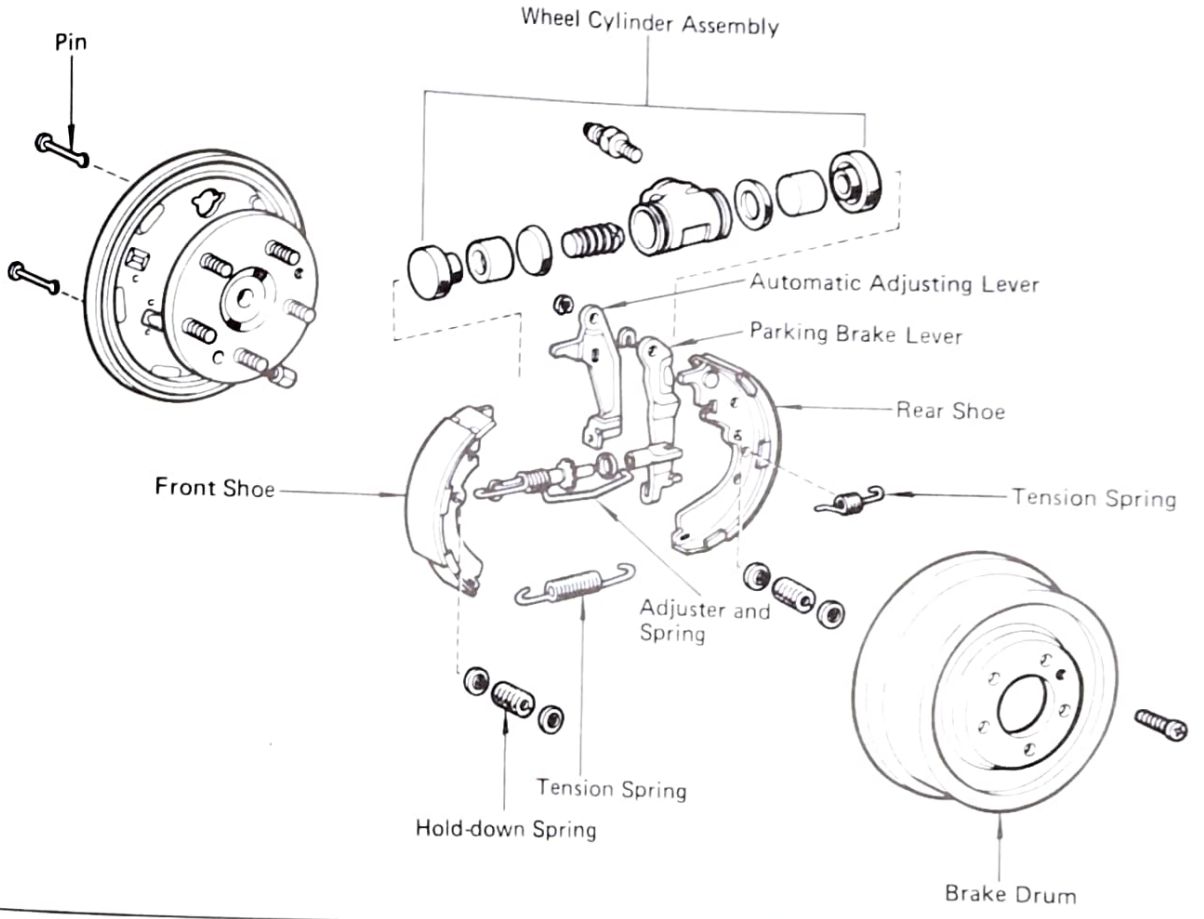
Torque: 7.5 – 10.5 kg-m (55 – 75 ft-lb)

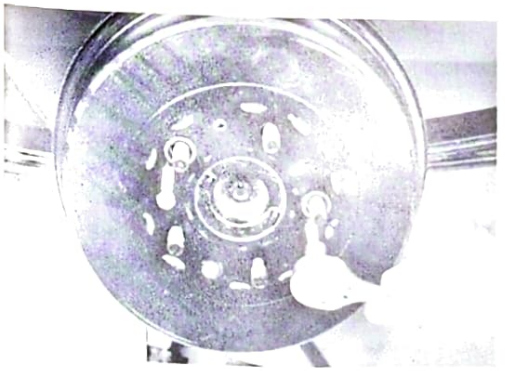
(b) Using a flare nut wrench*, connect the brake line.

*SST 09751-36011 or Commercial wrench

Torque: 1.3 – 1.8 kg-m (10 – 13 ft-lb)

REAR BRAKE
Leading-Trailing Type
(RN 1/2 ton, RN 3/4 ton)

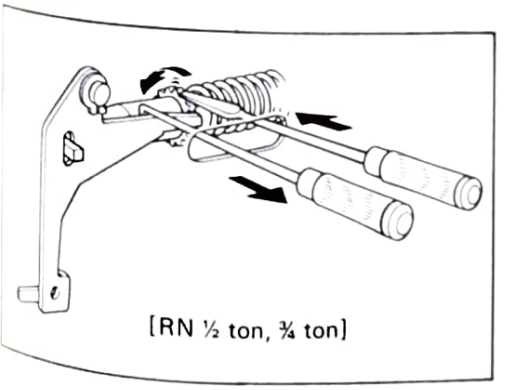




REMOVAL OF REAR BRAKE

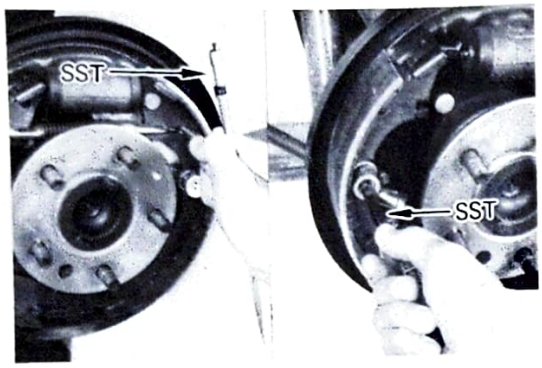
1. REMOVE REAR WHEEL AND BRAKE DRUM

NOTE: If the brake drum cannot be removed easily, perform the following steps:



(a) Insert a hook through the hole in the backing plate, and hold the adjuster lever away from the adjuster.

(b) Using a screwdriver, reduce the brake shoe adjustment by turning the adjuster.



2. REMOVE FRONT BRAKE SHOE AND ADJUSTER

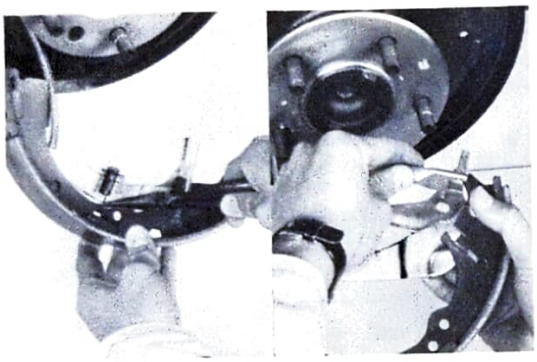
(a) Using a brake spring tool*, remove the return spring and adjuster.

*SST 09703-30010 or Commercial tool

(b) Using a hold-down spring tool*, remove the front shoe hold-down spring and pin.

*SST 09718-00010 or Commercial tool

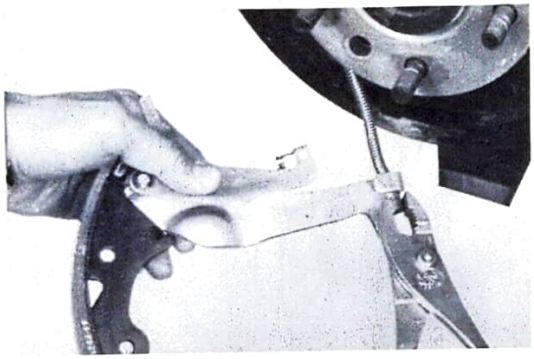
(c) Remove the front brake shoe and anchor spring.



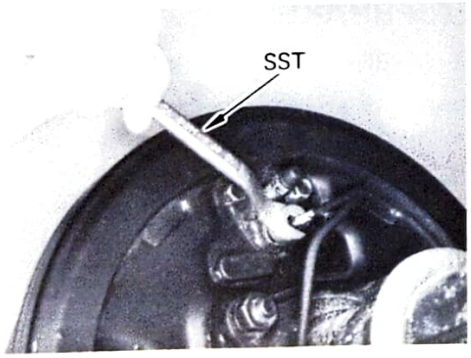
3. REMOVE REAR BRAKE SHOE, LEVER AND STRUT

(a) Remove hold-down spring and pin, and remove the rear shoe.

(b) Remove the strut and spring from the lever.



(c) Disconnect the parking brake cable from the lever.



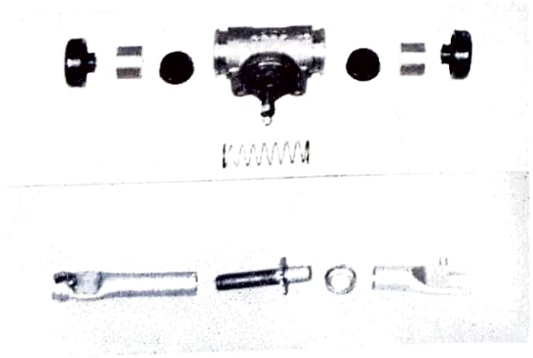
4. IF NECESSARY, REMOVE AND DISASSEMBLE WHEEL CYLINDER

(a) Using a flare nut wrench*, disconnect the line. Use a container to catch the brake fluid.

*SST 09751-36011 or Commercial wrench

(b) Remove two bolts and the wheel cylinder.

(c) Remove the two boots, two pistons, two piston cups and spring from the cylinder.



INSPECTION OF REAR BRAKE COMPONENTS

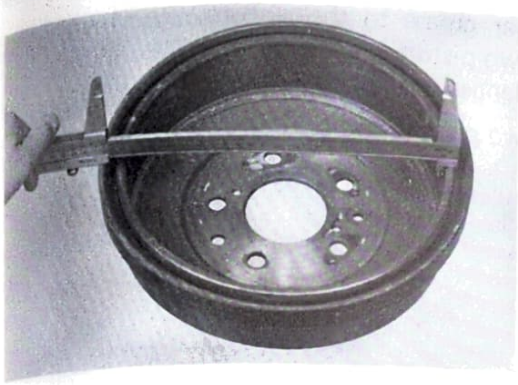
1. CLEAN WHEEL CYLINDER COMPONENTS WITH BRAKE FLUID

2. INSPECT CYLINDER COMPONENTS FOR WEAR, DAMAGE OR CORROSION

Replace the parts as necessary.

3. INSPECT ADJUSTER FOR WEAR OR DAMAGE

Replace the parts, as necessary.

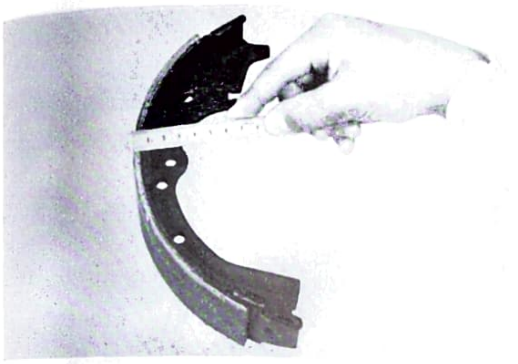


4. INSPECT BRAKE DRUM FOR CRACKS OR SCORING

5. MEASURE BRAKE DRUM INSIDE DIAMETER

Maximum inside diameter: 256.0 mm (10.079 in.)
Standard inside diameter: 254.0 mm (10.000 in.)

If the drum is scored or worn, the brake drum may be turned to the maximum inside diameter with a lathe.

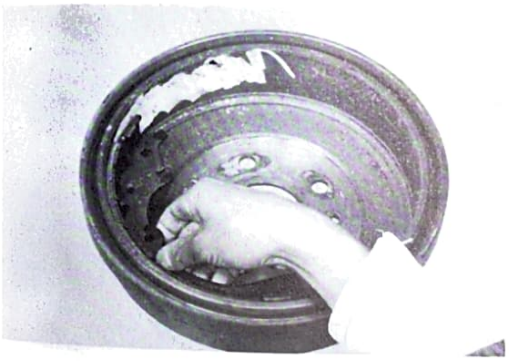


6. MEASURE BRAKE SHOE LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)

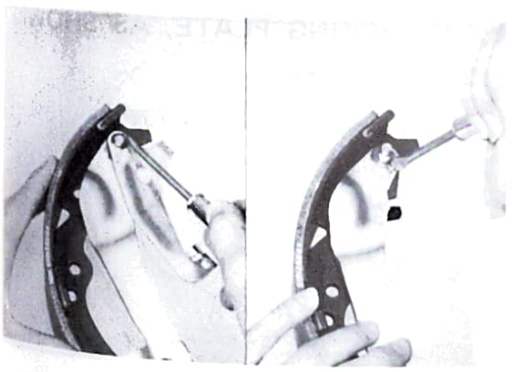
If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

NOTE: If any of the brake shoes have to be replaced, replace all the rear brake shoes to maintain effective brakes.



7. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

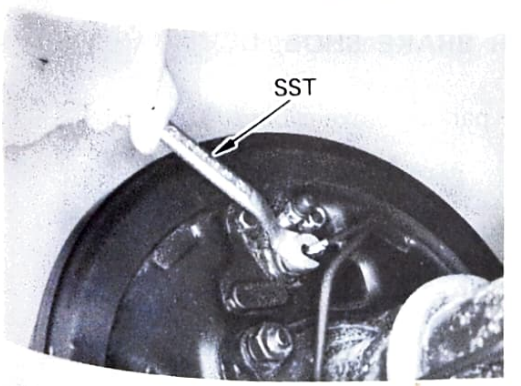
Replace the brake shoe or turn the brake drum, as necessary.



8. IF NECESSARY, REPLACE BRAKE SHOES

(a) Using a screwdriver, remove the parking brake lever and automatic adjusting lever from the rear shoe.

(b) Using pliers, install the parking brake lever and automatic adjusting lever with a new C washers.



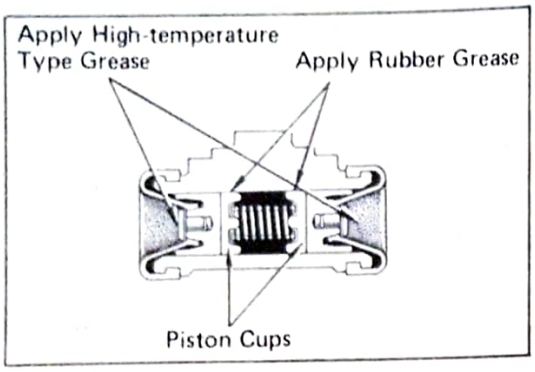
ASSEMBLY OF REAR BRAKE
(See illustration on page 15-27)

1. IF NECESSARY, INSTALL AND ASSEMBLE WHEEL CYLINDER

(a) Install the wheel cylinder on the backing plate with two bolts.

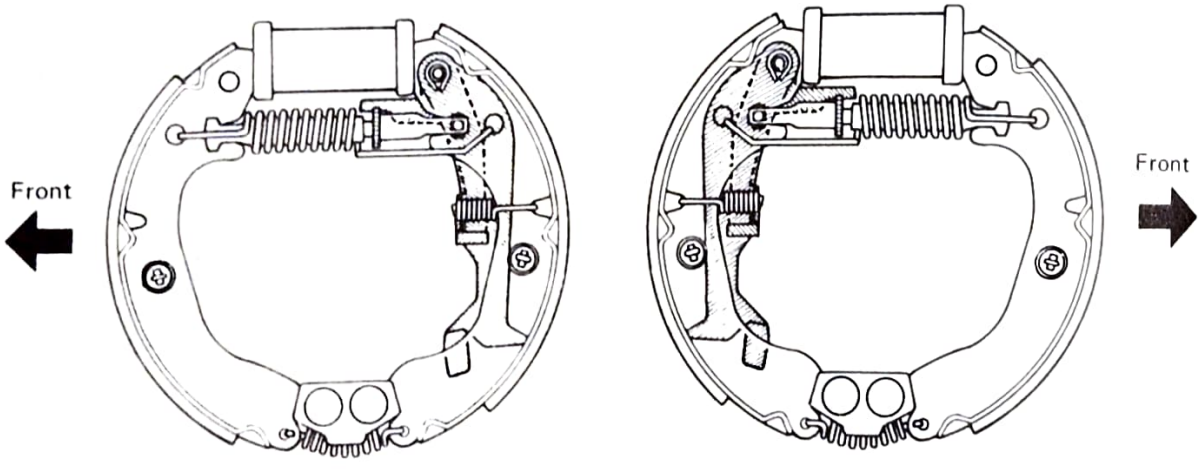
(b) Using a flare nut wrench*, connect the brake line.

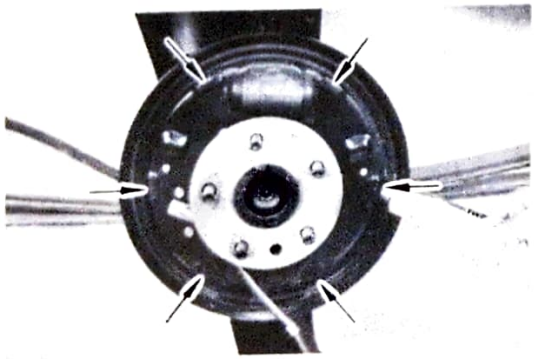
*SST 09751-36011 or Commercial wrench



(c) Apply rubber grease to the piston cups. Install the spring and two piston cups in the wheel cylinder. Make sure flanges of the cups are pointed inward.

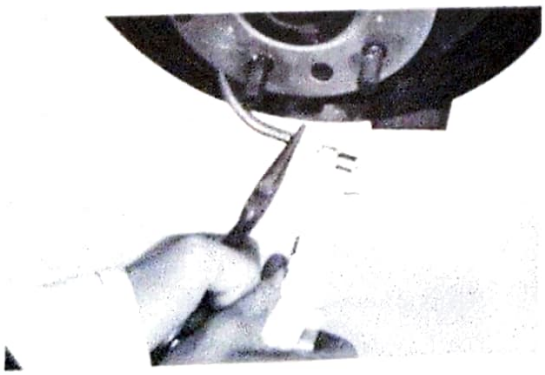
(d) Install the two pistons and boots to the cylinder.





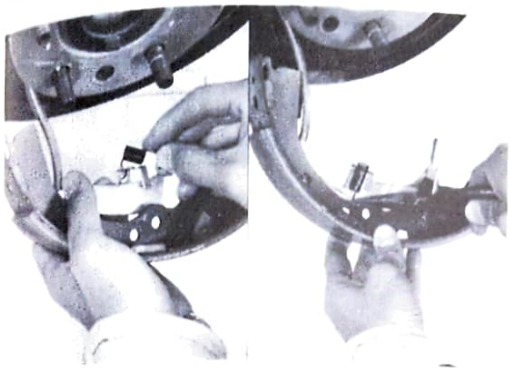
2. APPLY GREASE ON BACKING PLATE, AS SHOWN

Use a high-temperature type grease.

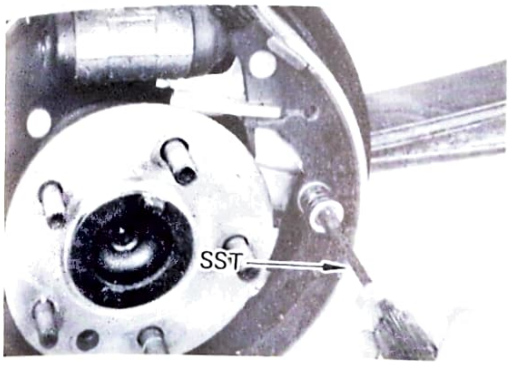


3. INSTALL REAR BRAKE SHOE, LEVER AND STRUT

(a) Connect the parking brake cable to the lever.



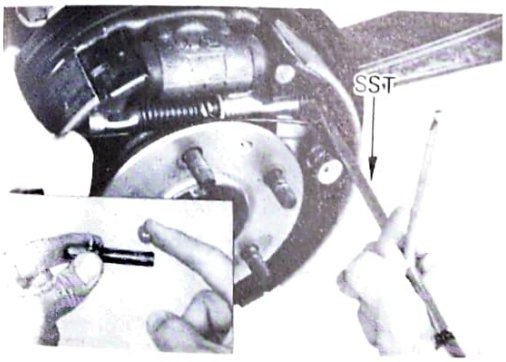
(b) Install the strut and spring to the lever.



(c) Set the rear brake shoe in place with the end of the shoe inserted in the wheel cylinder.

Using a hold-down spring tool*, install the shoe hold-down spring and pin.

*SST 09718-00010 or Commercial tool



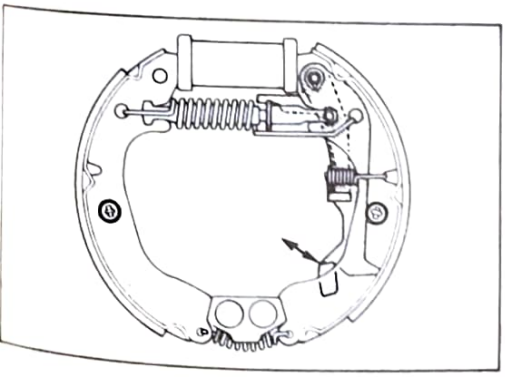
4. INSTALL FRONT BRAKE SHOE AND ADJUSTER

(a) Install the anchor spring between the front and rear shoes.

(b) Set the front brake shoe in place with the end of the shoe inserted in the wheel cylinder and the adjuster in place. Install the shoe hold-down spring and pin.

(c) Using a brake spring tool*, install the return spring.

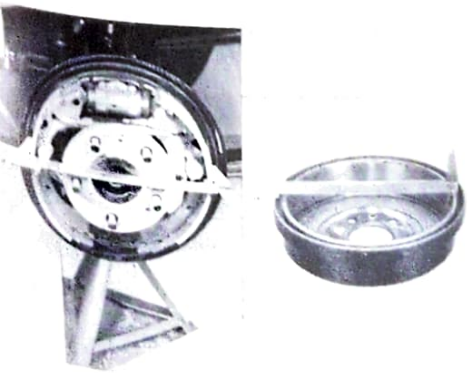
*SST 09703-30010 or Commercial tool



5. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

Move adjuster back and forth, as shown. Check that the adjusting bolt turns.

If the bolt does not turn, check for incorrect installation of the rear brakes.



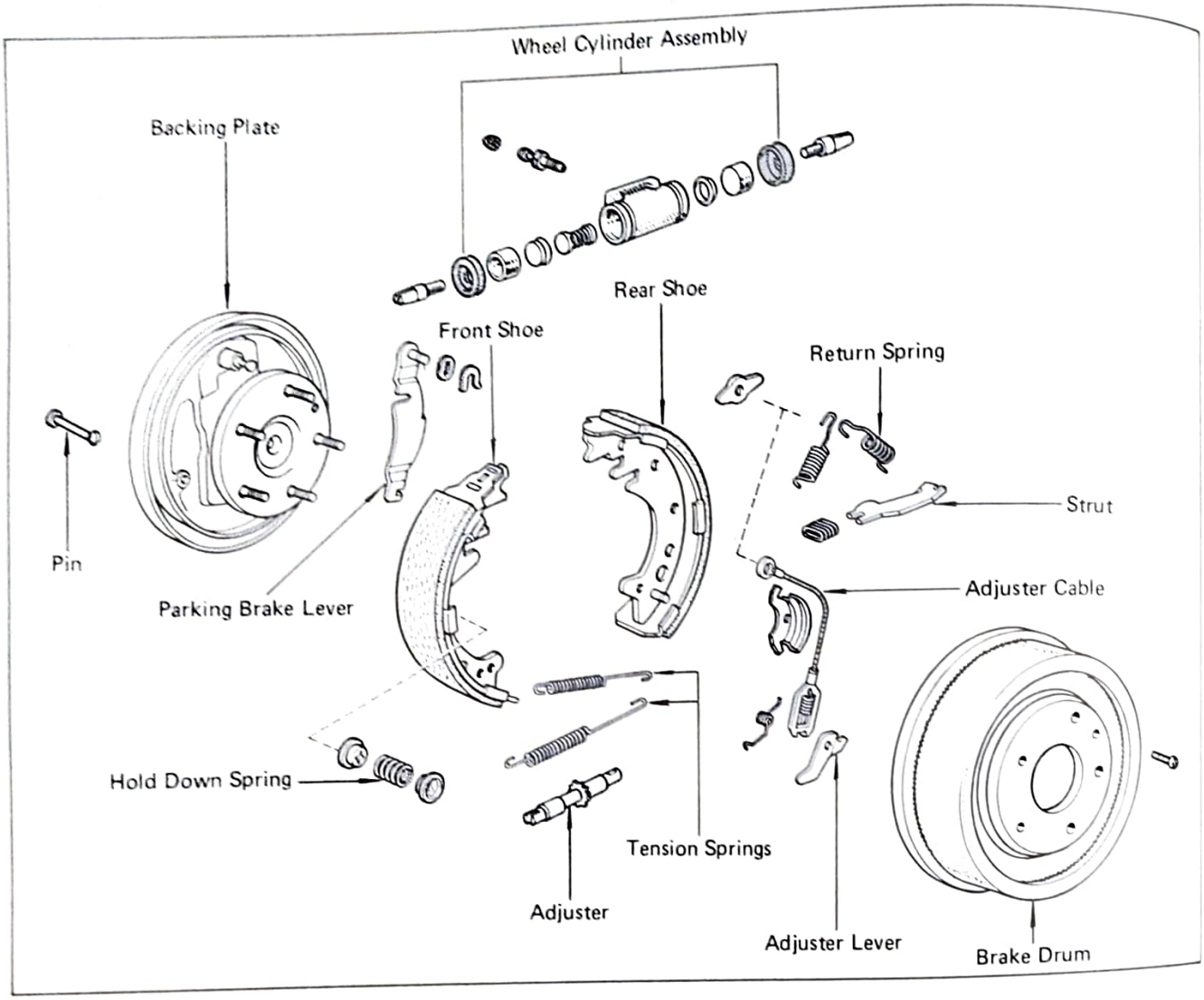
6. ADJUST CLEARANCE BETWEEN BRAKE SHOES AND DRUM

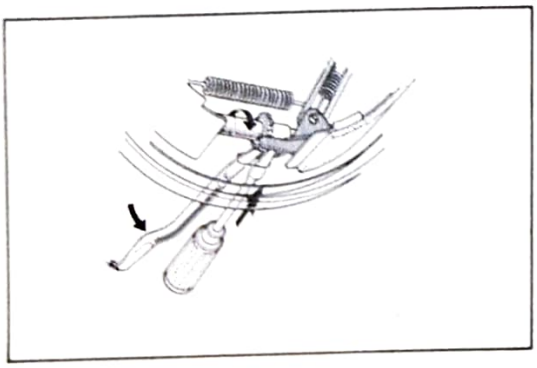
Measure the brake drum inside diameter and diameter of the brake shoes. Turn the adjusting bolt so that the difference between the diameters is the correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

7. INSTALL BRAKE DRUM AND REAR WHEEL

Duo-Servo Type (RN C&C)





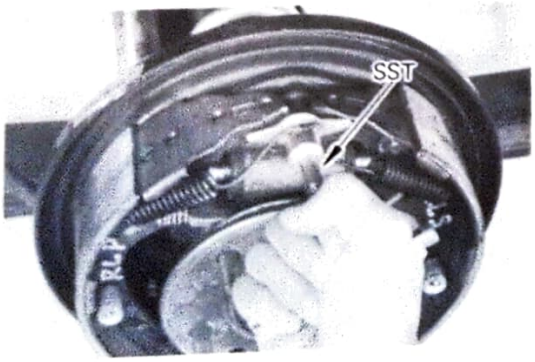
REMOVAL OF REAR BRAKE

1. REMOVE REAR WHEEL AND BRAKE DRUM

NOTE: If the brake drum cannot be removed easily, perform the following steps:

(a) Insert a screwdriver through the hole in the backing plate, and hold the adjuster lever away from the adjuster.

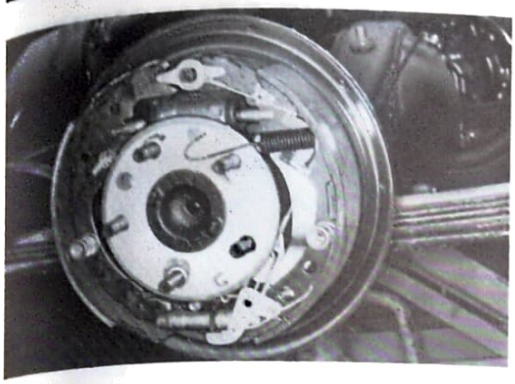
(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjuster.



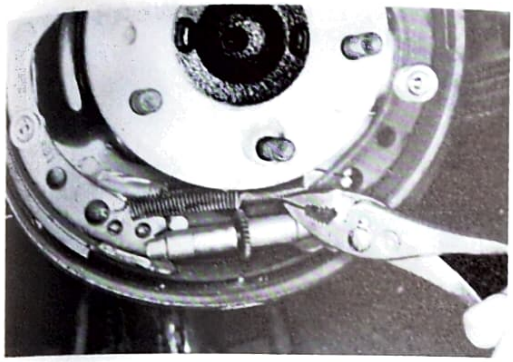
2. REMOVE SHOE RETURN SPRINGS

Using a brake spring remover*, remove the return springs.

*SST 09717-20010

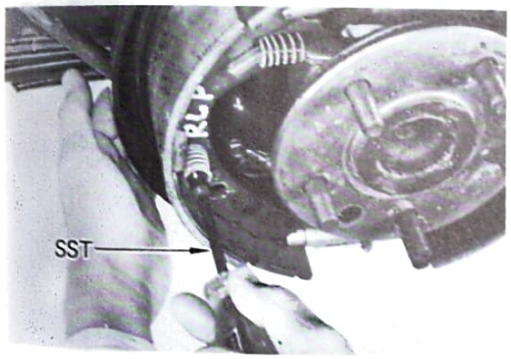


3. REMOVE ADJUSTING CABLE, CABLE GUIDE AND ADJUSTING



4. REMOVE TWO TENSION SPRINGS

Using pliers, remove the two tension springs.

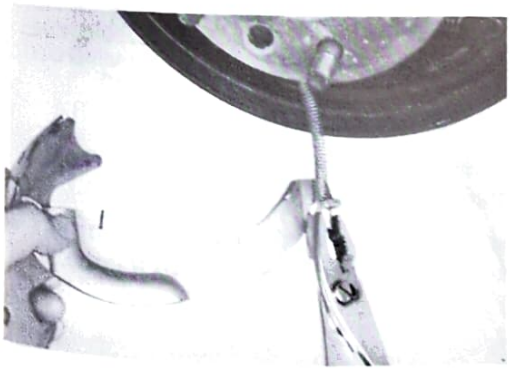


5. REMOVE SHOES ADJUSTER AND STRUT

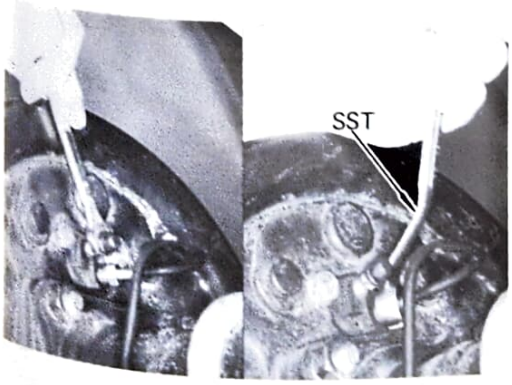
(a) Using a hold-down spring tool*, remove the shoe hold-down springs and pins.

*SST 09718-00010 or Commercial tool

(b) Remove the shoes, adjuster and strut.



(c) Disconnect the parking brake cable from the lever.



6. IF NECESSARY, REMOVE AND DISASSEMBLE WHEEL CYLINDER

(a) Remove the bleeder plug and then, using a flare nut wrench*, disconnect the line.

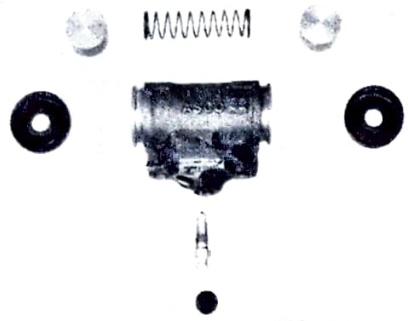
Use a container to catch the brake fluid.

*SST 09751-36011 or Commercial wrench

(b) Remove two bolts and the wheel cylinder.

(c) Remove two rods, boots, pistons, piston cups and one spring from the cylinder.

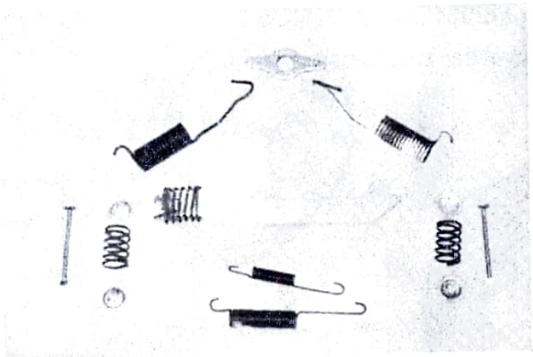
INSPECTION OF REAR BRAKE COMPONENTS



1. CLEAN WHEEL CYLINDER COMPONENTS WITH BRAKE FLUID

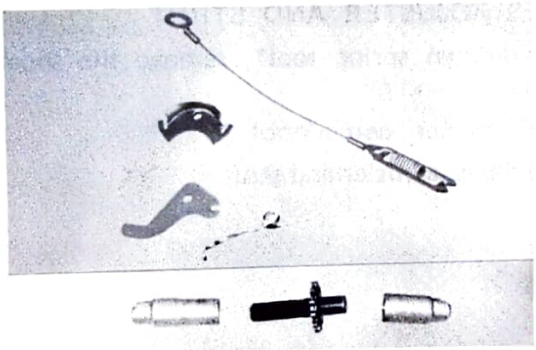
2. INSPECT PARTS FOR WEAR, DAMAGE OR CORROSION

   Replace the parts as necessary.



3. INSPECT SPRINGS AND STRUT FOR WEAR OR DAMAGE

   Replace the parts as necessary.



4. INSPECT CABLE AND ADJUSTER FOR WEAR OR DAMAGE

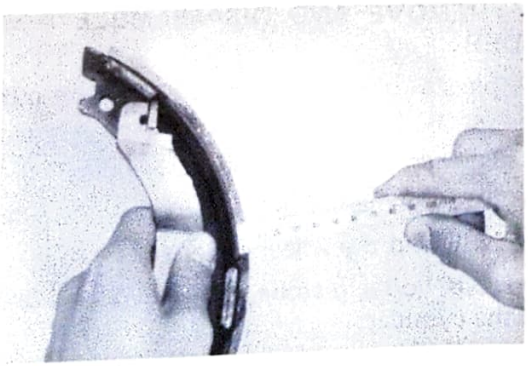
   Replace the parts as necessary.

5. INSPECT BRAKE DRUM FOR CRACKS OR SCORING

6. MEASURE BRAKE DRUM INSIDE DIAMETER

   Maximum inside diameter: 256.0 mm (10.079 in.)
   Standard inside diameter: 254.0 mm (10.000 in.)

   If the drum is scored or worn, the brake drum may be turned to the maximum inside diameter with a lathe.

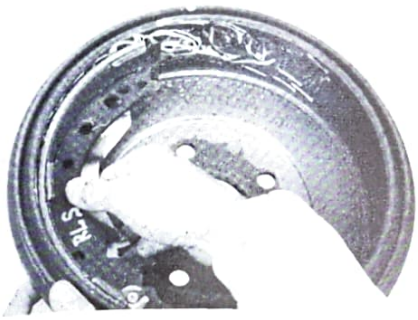


7. MEASURE BRAKE SHOE LINING THICKNESS

   Minimum thickness: 1.0 mm (0.039 in.)

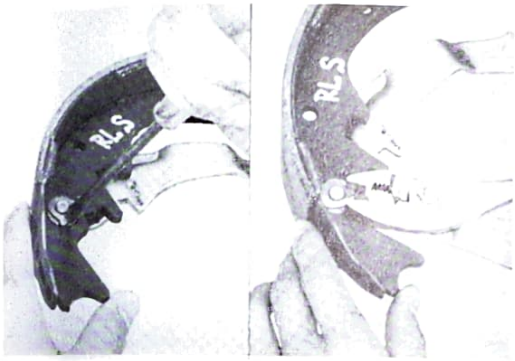
   If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

   NOTE: If any of the brake shoes have to be replaced, replace all the rear brake shoes to maintain effective brakes.



8. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

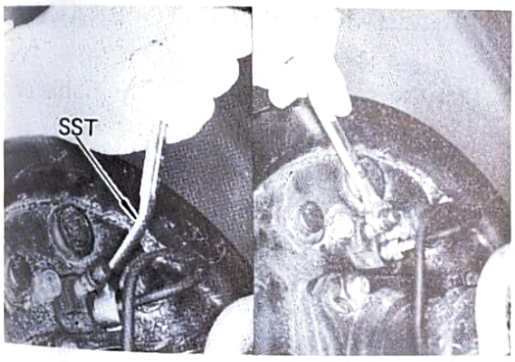
Replace the brake shoe or turn the brake drum, as necessary.



9. IF NECESSARY, REPLACE BRAKE SHOES

(a) Using a screwdriver, remove the parking brake lever from the rear shoe.

(b) Using pliers, install the parking brake lever with a new C washer.



ASSEMBLY OF REAR BRAKE
(See illustration on page 15-32)

1. IF NECESSARY, ASSEMBLE AND INSTALL WHEEL CYLINDER

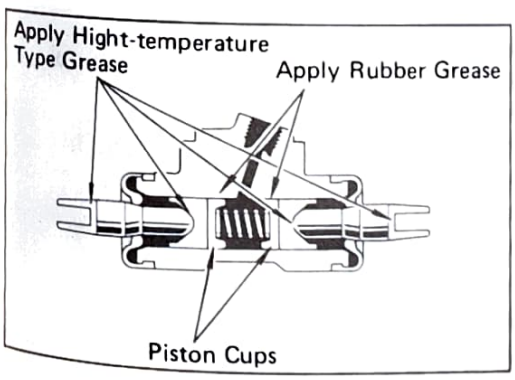
(a) Install the wheel cylinder on the backing plate with two bolts.

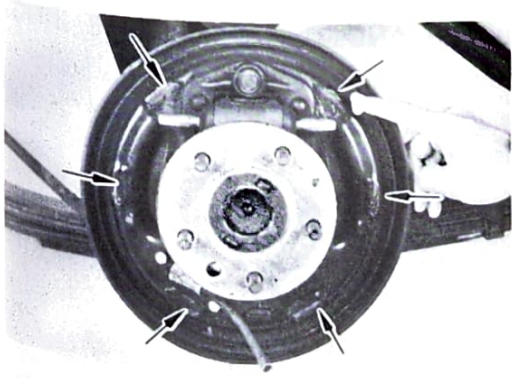
(b) Using a flare nut wrench*, connect the brake line and install the bleeder plug.

*SST 09751-36011 or Commercial wrench

(c) Apply rubber grease to the piston cups. Install the spring and two piston cups in the wheel cylinder. Make sure flanges of the cups are pointed inward.

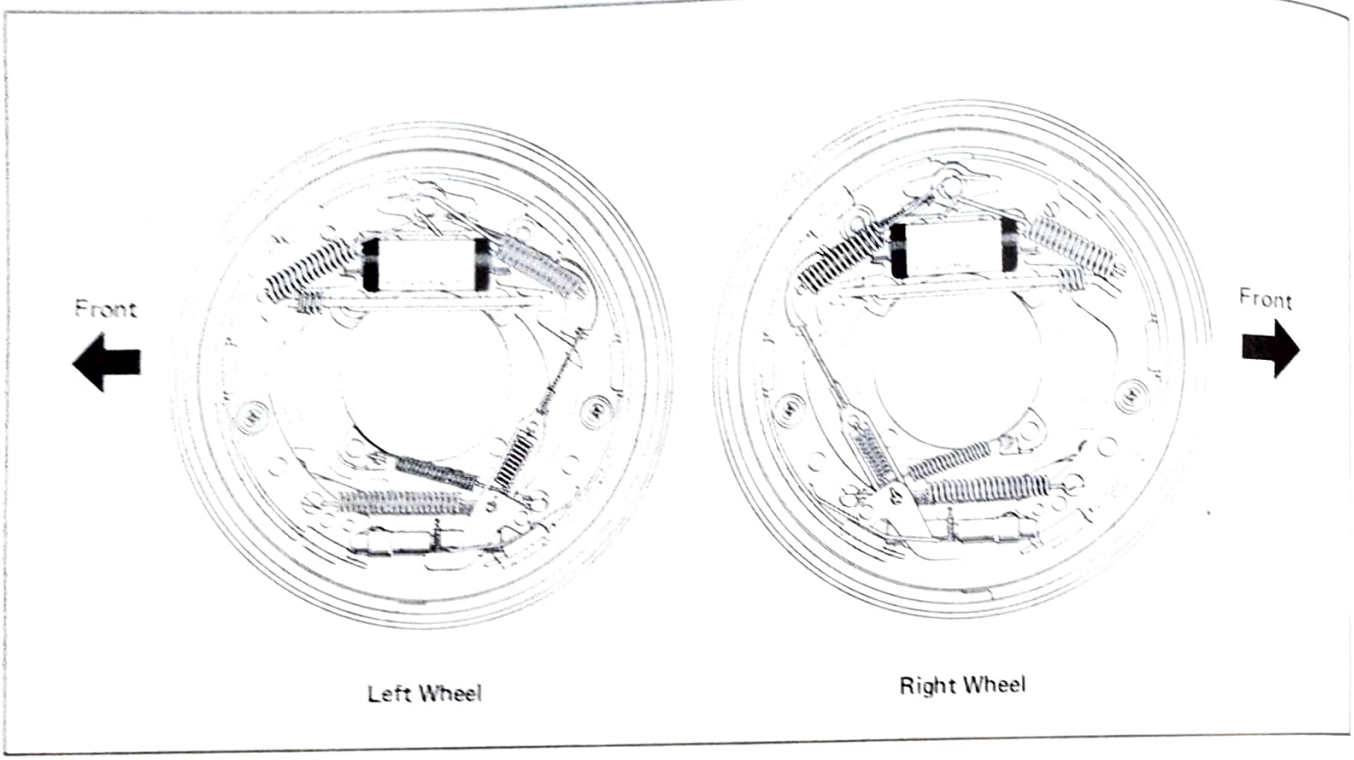
(d) Install the two pistons, boots and rods in the cylinder.

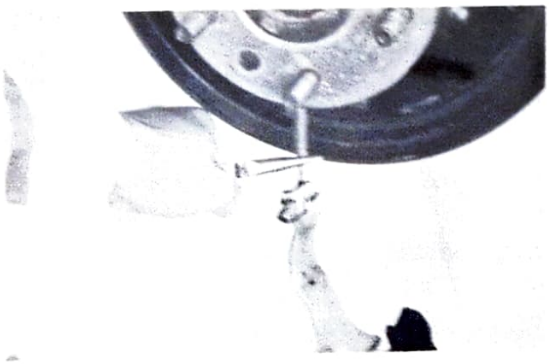




2. APPLY GREASE ON BACKING PLATE, AS SHOWN

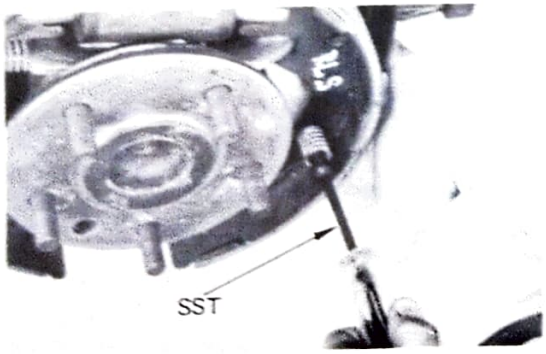
Use a high-temperature type grease.





3. CONNECT PARKING BRAKE CABLE TO BRAKE LEVER

Using pliers, compress the spring and install the cable end to the lever.

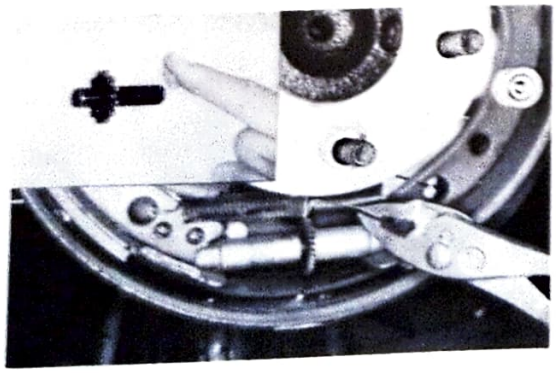


4. INSTALL STRUT AND BRAKE SHOES

(a) Install the strut with the spring forward.

(b) Set the brake shoes in place with the ends of the shoes inserted in the piston rods and the strut in place. Using a brake spring driver*, install the shoe hold-down springs and pins.

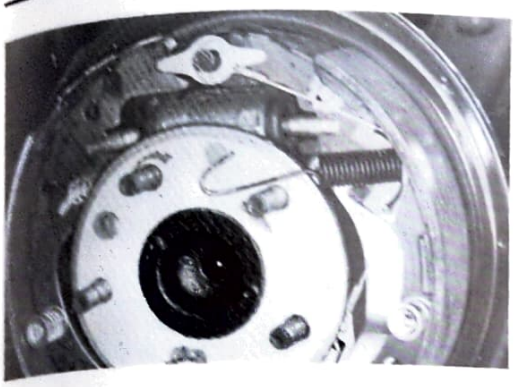
*SST 09718-00010



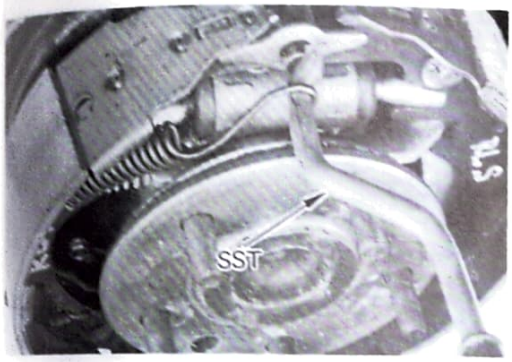
5. INSTALL ADJUSTER AND TWO TENSION SPRINGS

(a) Apply high-temperature type grease to the adjuster.

(b) Install the adjuster and using a pair of pliers, install the two tension springs.



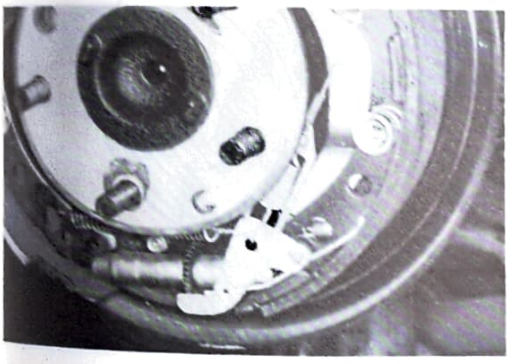
6. INSTALL SHOE GUIDE PLATE, ADJUSTING CABLE AND CABLE GUIDE



7. INSTALL RETURN SPRINGS

Using a brake spring replacer*, install the front return spring and then install the rear return spring.

*SST 09718-20010

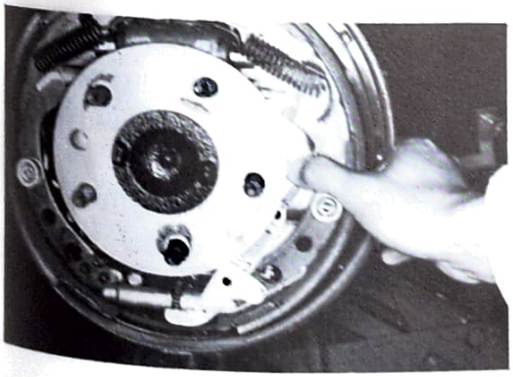


8. INSTALL ADJUSTING LEVER

(a) Install the tension spring to the rear shoe.

(b) Hook the adjusting lever with the cable and install the lever.

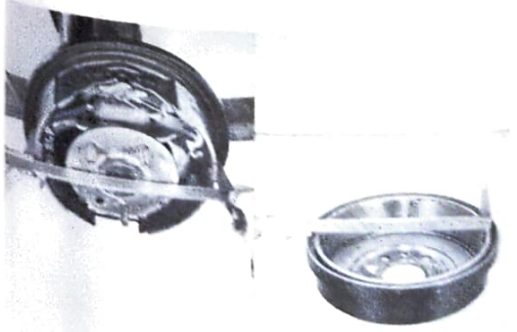
(c) Hold the adjusting lever with the tension spring.



9. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

Pull the adjusting cable backward, as shown, and release. Check that the adjusting bolt turns.

If the bolt does not turn, check for incorrect installation of the rear brakes.



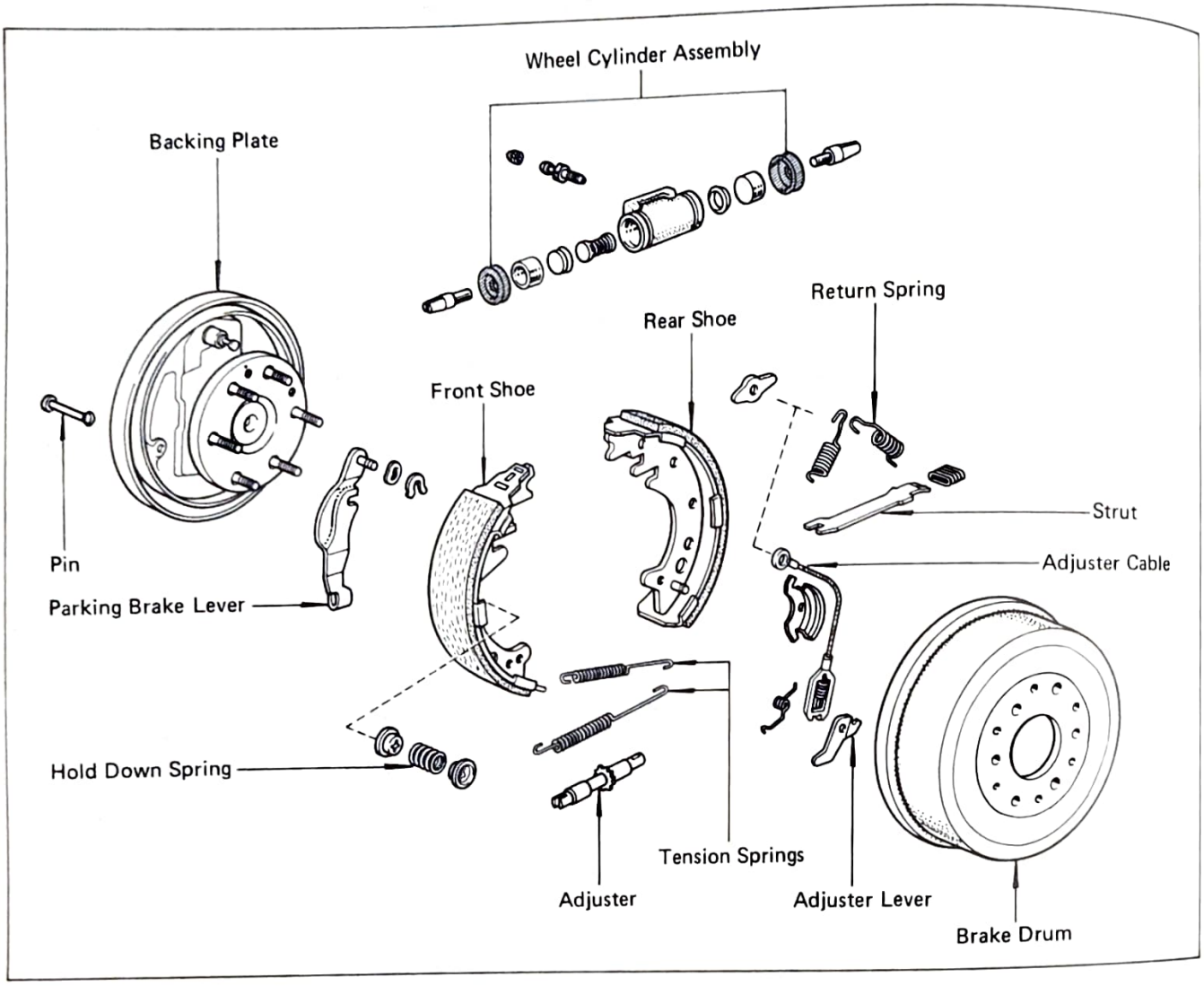
10. ADJUST CLEARANCE BETWEEN BRAKE SHOES AND DRUM

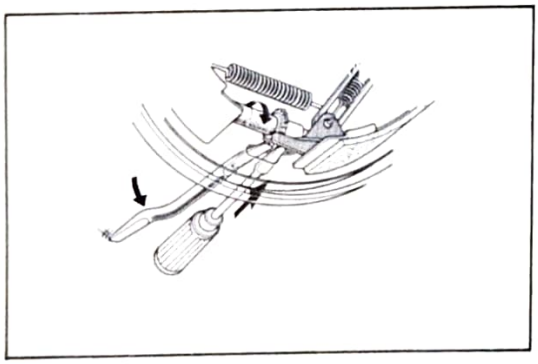
Measure the brake drum inside diameter and diameter of the brake shoes. Turn the adjusting bolt so that the difference between the diameters is the correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

11. INSTALL BRAKE DRUM AND REAR WHEEL

Duo-Servo Type (RN 4×4)





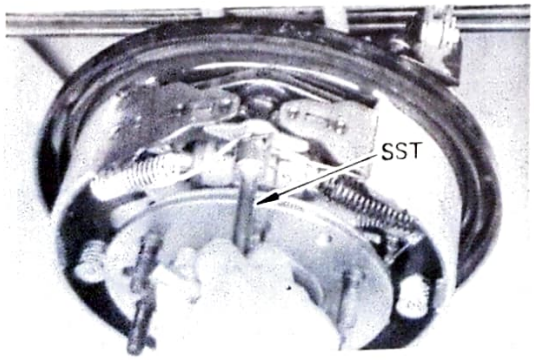
REMOVAL OF REAR BRAKE

1. REMOVE REAR WHEEL AND BRAKE DRUM

NOTE: If the brake drum cannot be removed easily, perform the following steps:

(a) Insert a screwdriver through the hole in the backing plate, and hold the adjuster lever away from the adjuster.

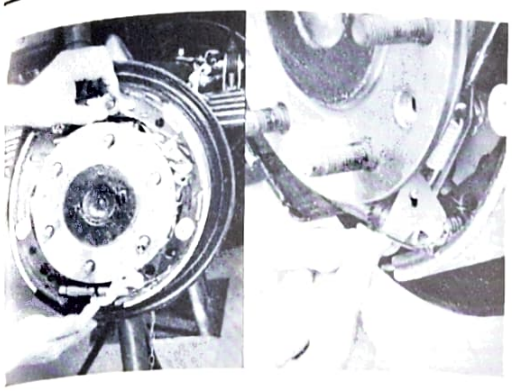
(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.



2. REMOVE SHOE RETURN SPRING

Using a brake spring tool*, remove the return spring.

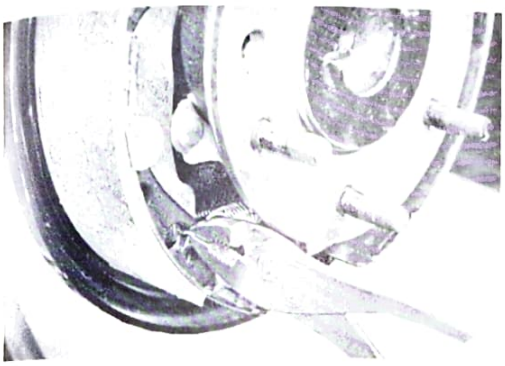
*SST 09717-20010



3. REMOVE ADJUSTING CABLE, CABLE GUIDE AND ADJUSTING LEVER

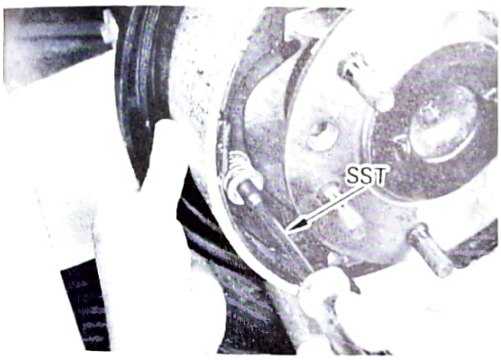
(a) Push up the lever and remove the cable and cable guide.

(b) Take off the spring from the lever and remove the lever and spring.



4. REMOVE TWO TENSION SPRINGS

Using pliers, remove the two tension springs.



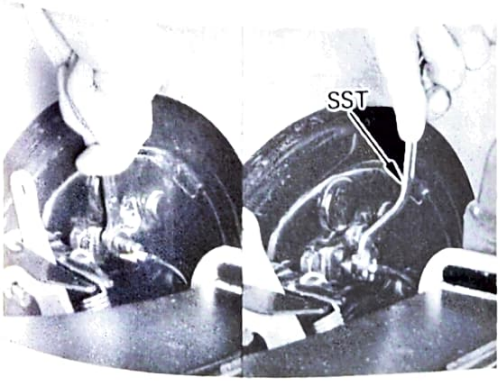
5. REMOVE SHOES, ADJUSTER AND STRUT

(a) Using a hold-down spring tool*, remove the shoe hold-down springs and pins.

*SST 09718-00010 or Commercial tool

(b) Remove the shoes, adjuster and strut.

(c) Disconnect the parking brake cable from the bell-crank.



6. IF NECESSARY, REMOVE AND DISASSEMBLE WHEEL CYLINDER

(a) Remove the bleeder plug and then, using a flare nut wrench*, disconnect the line.

Use a container to catch the brake fluid.

*SST 09751-36011 or Commercial wrench

(b) Remove two bolts and the wheel cylinder.

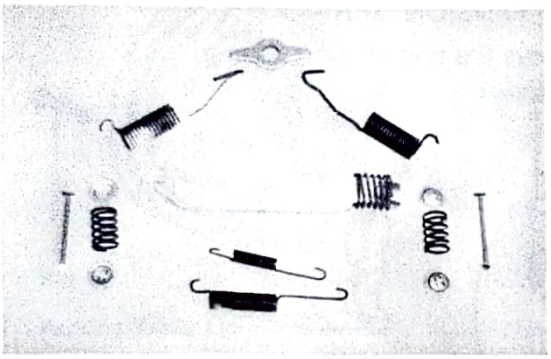
(c) Remove two rods, boots, pistons, piston cups and one spring from the cylinder.

INSPECTION OF REAR BRAKE COMPONENTS

1. CLEAN WHEEL CYLINDER COMPONENTS WITH BRAKE FLUID

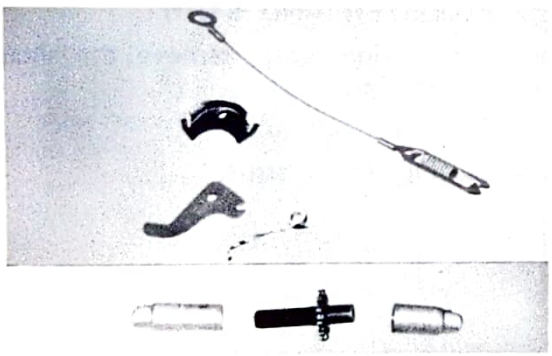
2. INSPECT PARTS FOR WEAR, DAMAGE OR CORROSION

   Replace the parts as necessary.



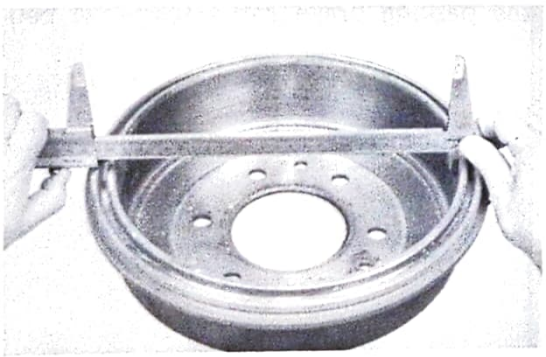
3. INSPECT SPRINGS AND STRUT FOR WEAR OR DAMAGE

   Replace the parts as necessary.



4. INSPECT CABLE AND ADJUSTER FOR WEAR OR DAMAGE

   Replace the parts as necessary.

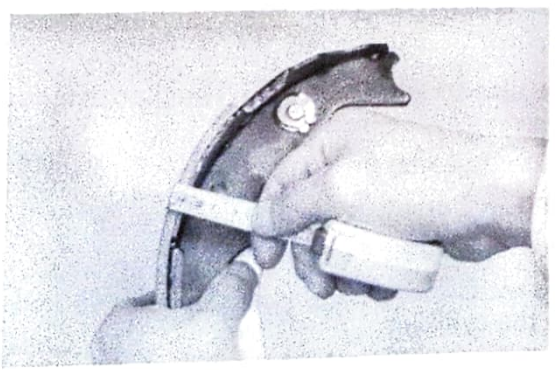


5. INSPECT BRAKE DRUM FOR CRACKS OR SCORING

6. MEASURE BRAKE DRUM INSIDE DIAMETER

   Maximum inside diameter: 256.0 mm (10.079 in.)
   Standard inside diameter: 254.0 mm (10.000 in.)

   If the drum is scored or worn, the brake drum may be turned to the maximum inside diameter with a lathe.



7. MEASURE BRAKE SHOE LINING THICKNESS

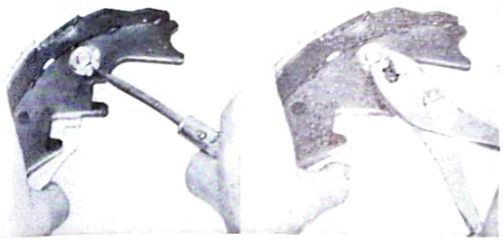
   Minimum thickness: 1.0 mm (0.039 in.)

   If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

   NOTE: If any of the brake shoes have to be replaced, replace all the rear brake shoes to maintain effective brakes.

8. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

Replace the brake shoe or turn the brake drum, as necessary.

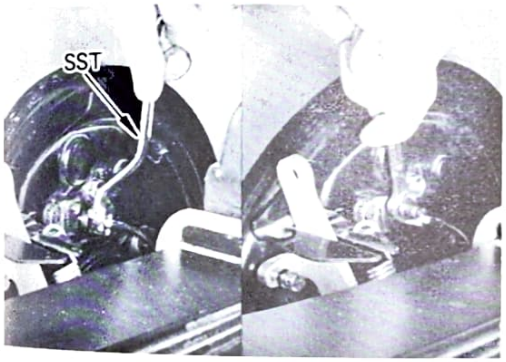


9. IF NECESSARY, REPLACE BRAKE SHOES

(a) Using a screwdriver, remove the parking brake lever from the front shoe.

(b) Using pliers, install the parking brake lever with a new C washer.

ASSEMBLY OF REAR BRAKES
(See illustration on page 15-38)



1. IF NECESSARY, ASSEMBLE AND INSTALL WHEEL CYLINDER

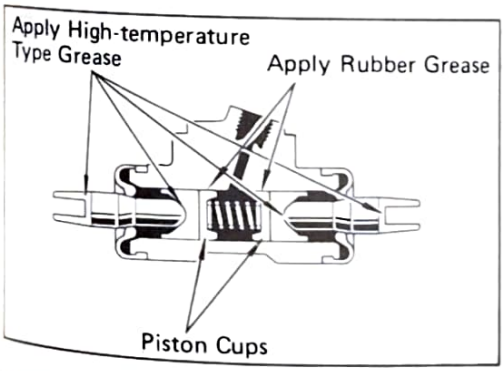
(a) Install the wheel cylinder on the backing plate with two bolts.

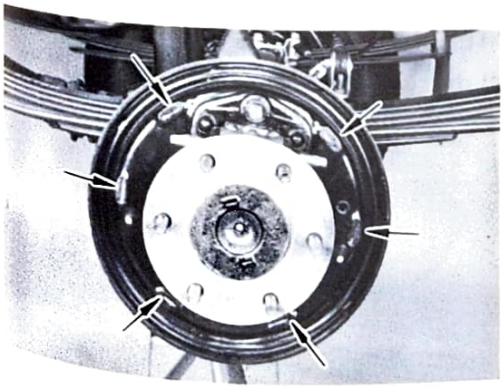
(b) Using a flare nut wrench*, connect the brake line and install the bleeder plug.

*SST 09751-36011 or Commercial wrench

(c) Apply rubber grease to the piston cups. Install the spring and two piston cups in the wheel cylinder. Make sure flanges of the cups are pointed inward.

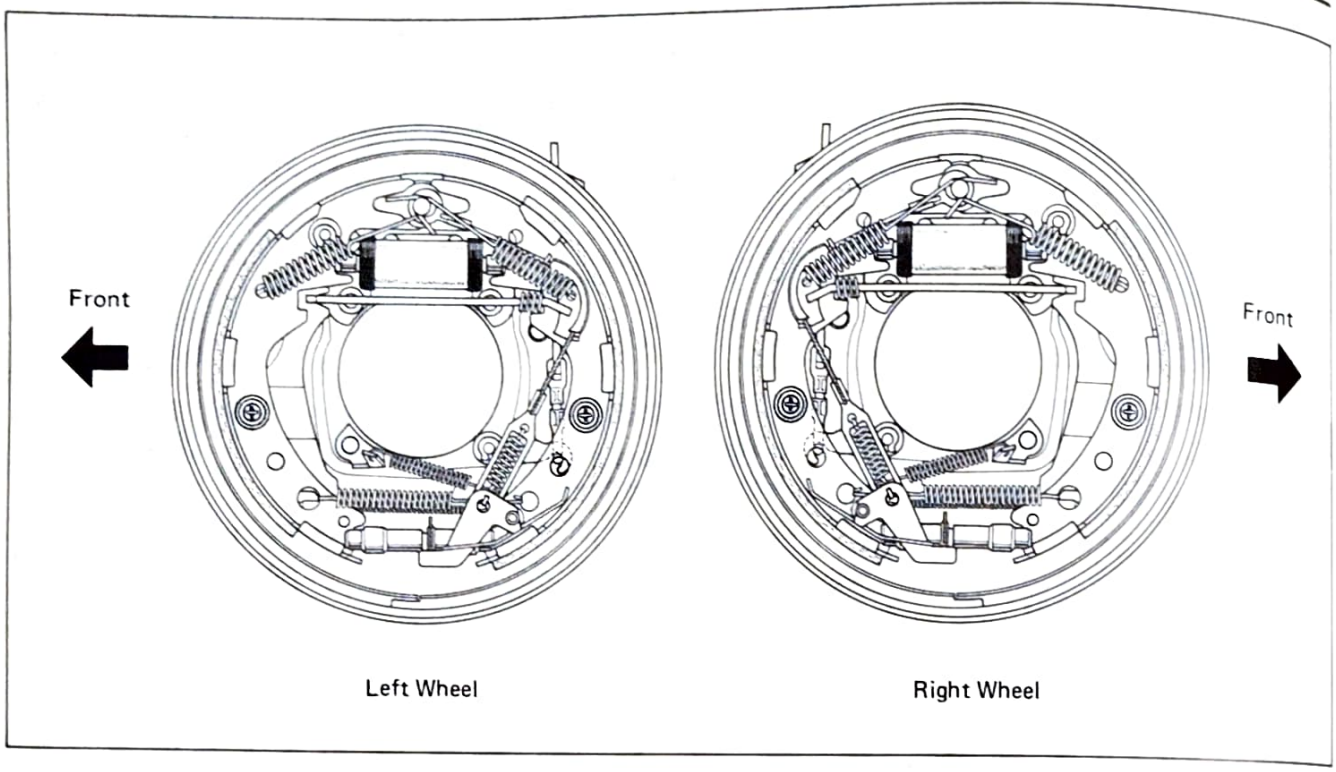
(d) Install the two pistons, boots and rods in the cylinder.

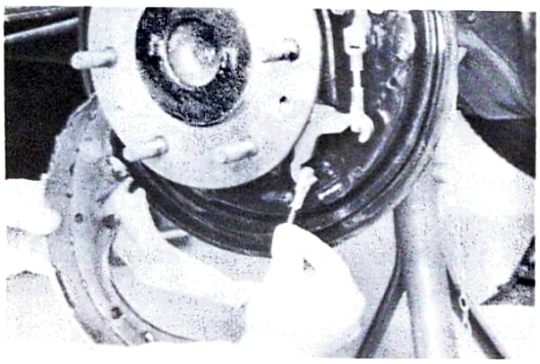




2. APPLY GREASE ON BACKING PLATE, AS SHOWN

Use a high-temperature type grease.

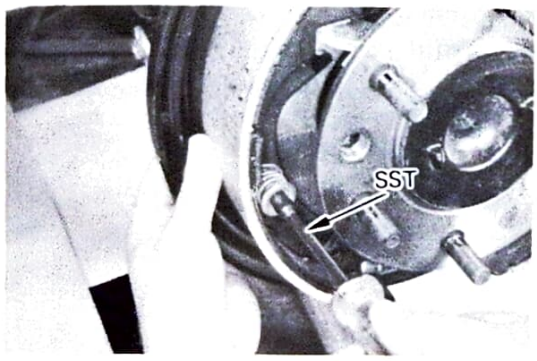




3. INSTALL STRUT AND SHOES

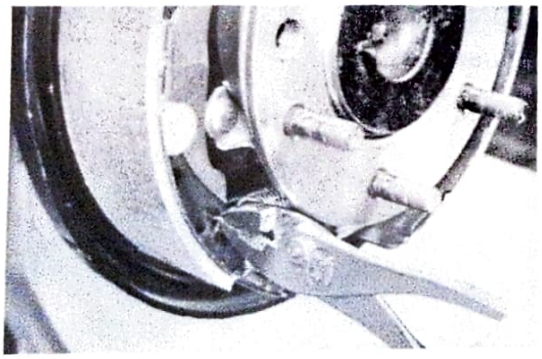
(a) Install the strut with the spring rearward.

(b) Install the parking brake cable to the bellcrank.



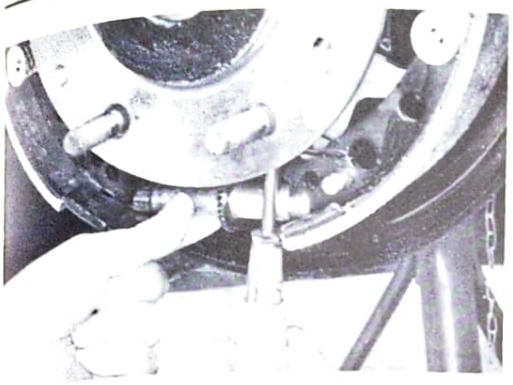
(c) Set the brake shoes in place with the ends of the shoes inserted in the piston rods and the strut in place. Using a hold-down spring tool*, install the shoe hold-down springs and pins.

*SST 09718-00010 or Commercial tool



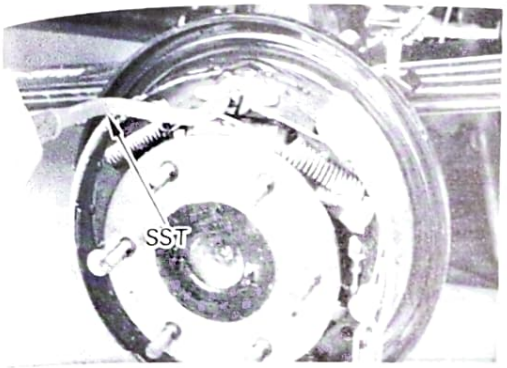
4. INSTALL TWO TENSION SPRINGS

Using pliers, install the two tension springs.



5. INSTALL ADJUSTER

Using a screw driver, open the shoes and install the adjuster.

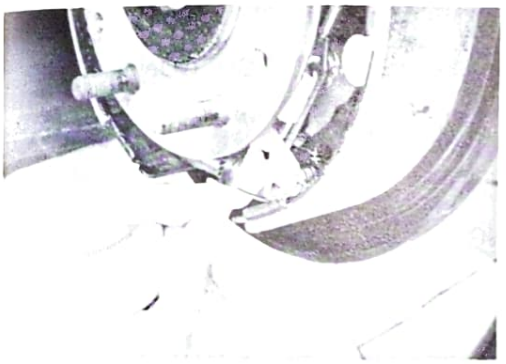


6. INSTALL ADJUSTING CABLE AND RETURN SPRINGS

(a) Install the shoe guide plate, cable guide and adjusting cable.

(b) Using a brake spring replacer*, install the front return spring and then install the rear return spring.

*SST 09718-20010

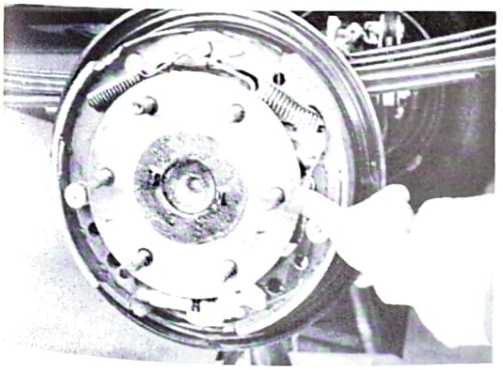


7. INSTALL ADJUSTING LEVER

(a) Install the tension spring to the rear shoe.

(b) Hook the adjusting lever with the cable and install the lever.

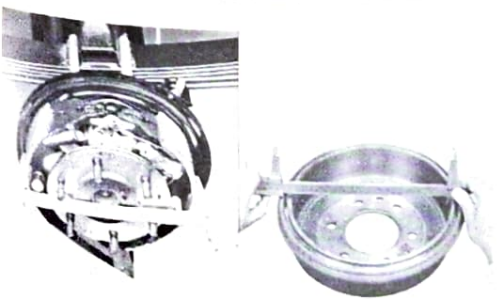
(c) Hold the adjusting lever with the tension spring.



8. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

Pull the adjusting cable backward as shown, and release. Check that the adjusting bolt turns.

If the bolt does not turn, check for incorrect installation of the rear brakes.



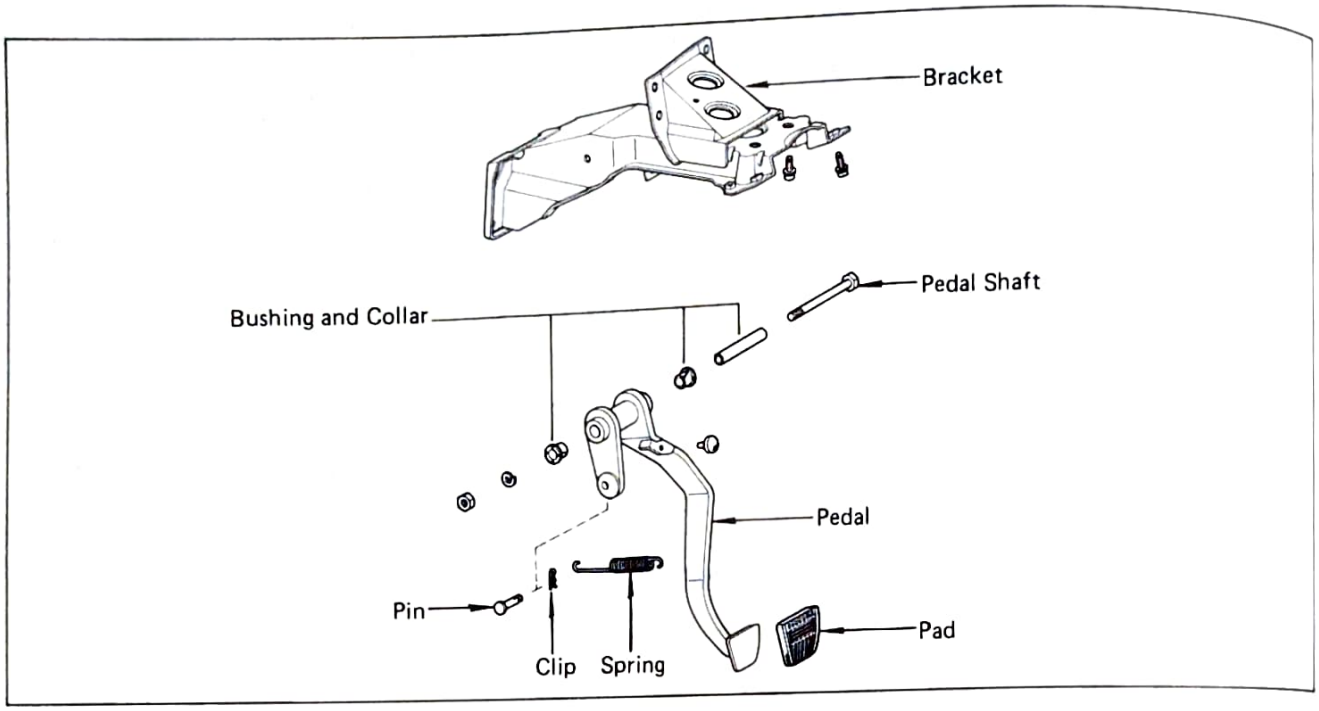
9. ADJUST CLEARANCE BETWEEN BRAKE SHOES AND DRUM

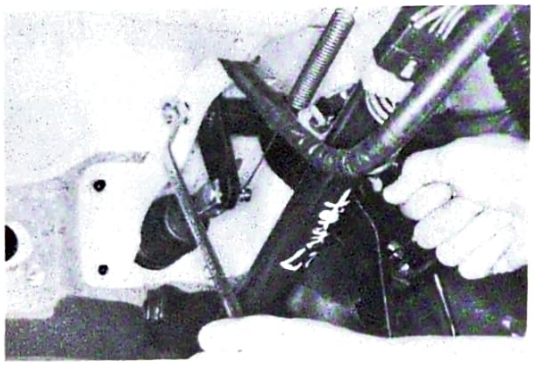
Measure the brake drum inside diameter and diameter of the brake shoes. Turn the adjusting bolt so that the difference between the diameters is the correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

10. INSTALL BRAKE DRUM AND REAR WHEEL

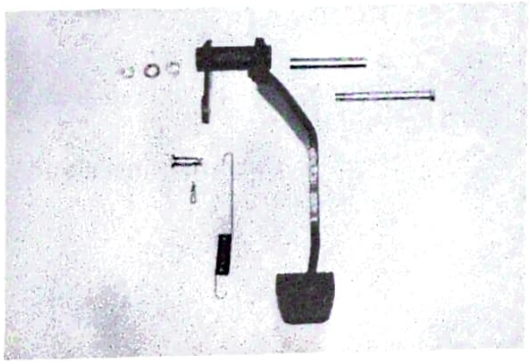
BRAKE PEDAL





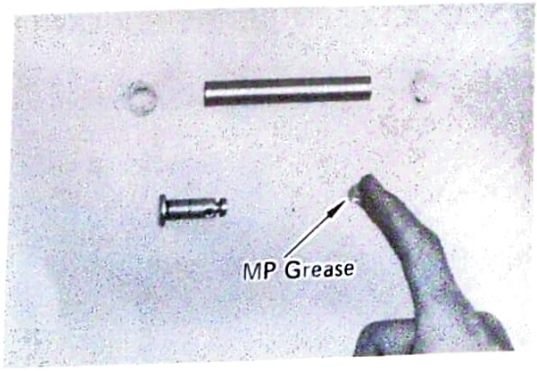
REMOVAL OF BRAKE PEDAL

1. DISCONNECT STOP LIGHT SWITCH CONNECTOR
2. REMOVE PUSH ROD PIN
   Remove the clip and pull out the push rod pin.
3. REMOVE SPRING
4. REMOVE PEDAL SHAFT
5. REMOVE BRAKE PEDAL WITH BUSHINGS AND COLLAR



INSPECTION OF BRAKE PEDAL PARTS

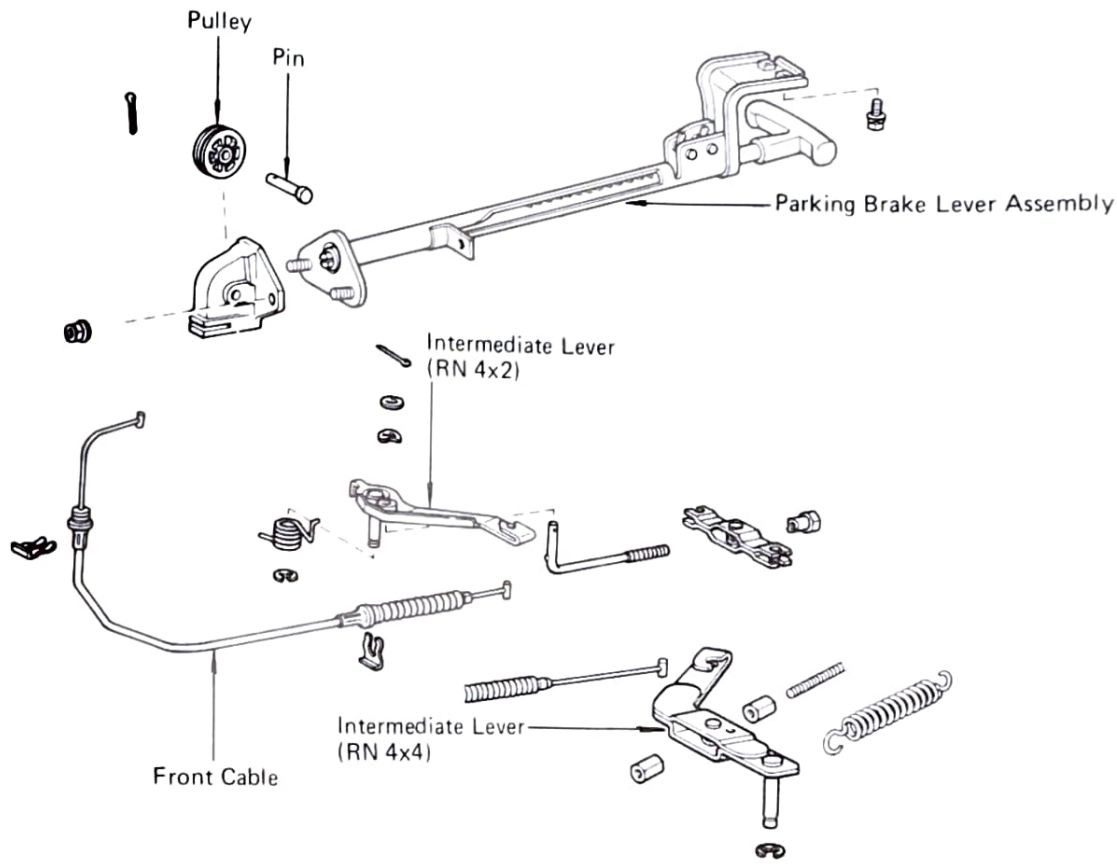
INSPECT ALL PARTS FOR WEAR OR DAMAGE

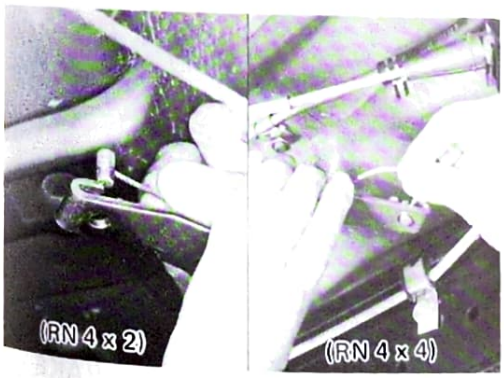


INSTALLATION OF BRAKE PEDAL

1. COAT BUSHINGS WITH MULTIPURPOSE GREASE
2. PLACE BRAKE PEDAL WITH BUSHINGS AND COLLAR IN POSITION
3. INSTALL PEDAL SHAFT
4. INSTALL SPRING
5. INSTALL PUSH ROD PIN WITH CLIP
6. ADJUST PEDAL HEIGHT (See page 15-4)
7. CONNECT STOP LIGHT SWITCH CONNECTOR

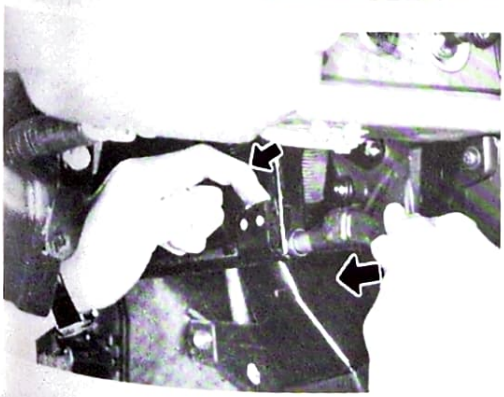
PARKING BRAKE
Parking Brake Lever and Front Cable



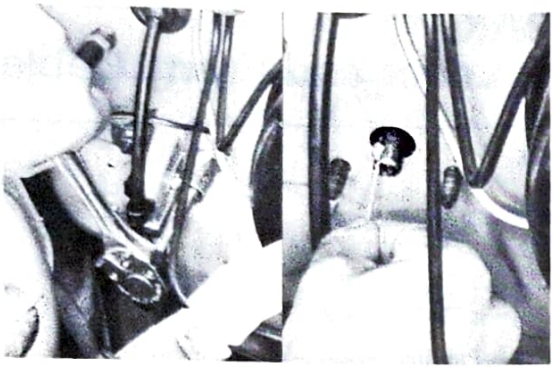


REMOVAL OF PARKING BRAKE LEVER AND FRONT CABLE

1. DISCONNECT FRONT CABLE FROM INTERMEDIATE LEVER

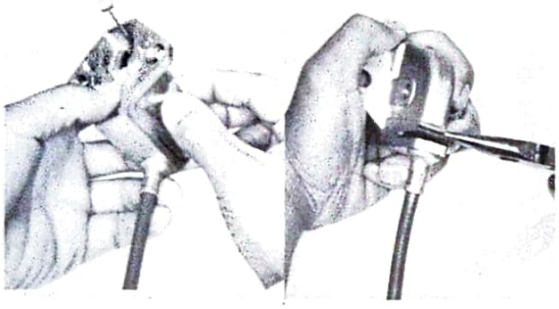


2. PUSH PARKING BRAKE PAWL AND COMPLETELY RETURN PARKING BRAKE LEVER
   (a) Remove the parking brake indicator light switch.
   (b) Push the parking brake pawl and completely return the parking brake lever.



3. REMOVE PULLEY BRACKET WITH FRONT CABLE FROM PARKING BRAKE LEVER SHAFT

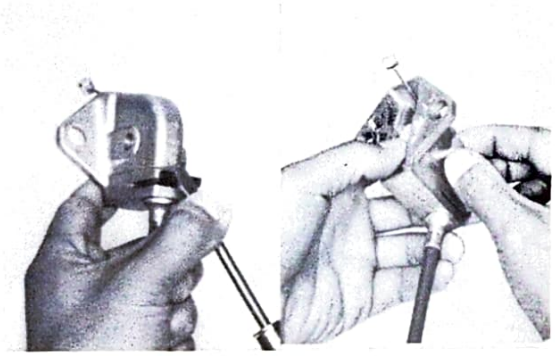
Remove the bracket and disconnect the front cable from the shaft.



4. REMOVE FOLLOWING PARTS FROM PULLEY BRACKET:

(a) Pulley pin
(b) Pulley
(c) Clip
(d) Front cable

INSTALLATION OF PARKING BRAKE LEVER AND FRONT CABLE (See illustration on page 15-45)

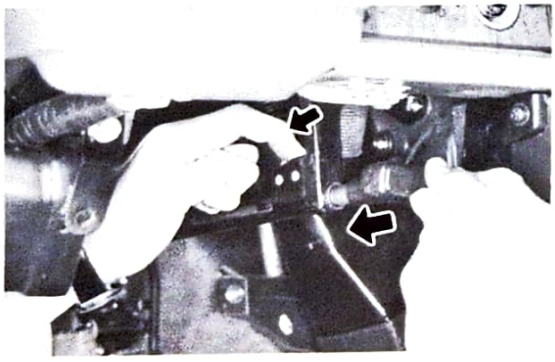


1. INSTALL FRONT CABLE AND PULLEY TO PULLEY BRACKET

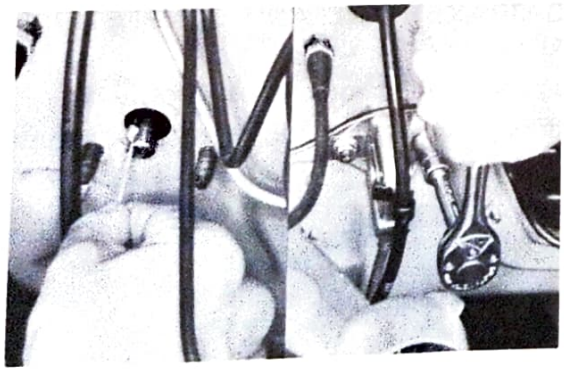
(a) Insert the front cable in the bracket and secure it with a clip.

(b) Coat the pulley pin with multipurpose grease.

(c) Install the pulley and pulley pin, and secure the pin with a cotter pin.



2. PUSH PARKING BRAKE PAWL AND COMPLETELY RETURN PARKING BRAKE LEVER



3. CONNECT FRONT CABLE TO PARKING BRAKE LEVER SHAFT

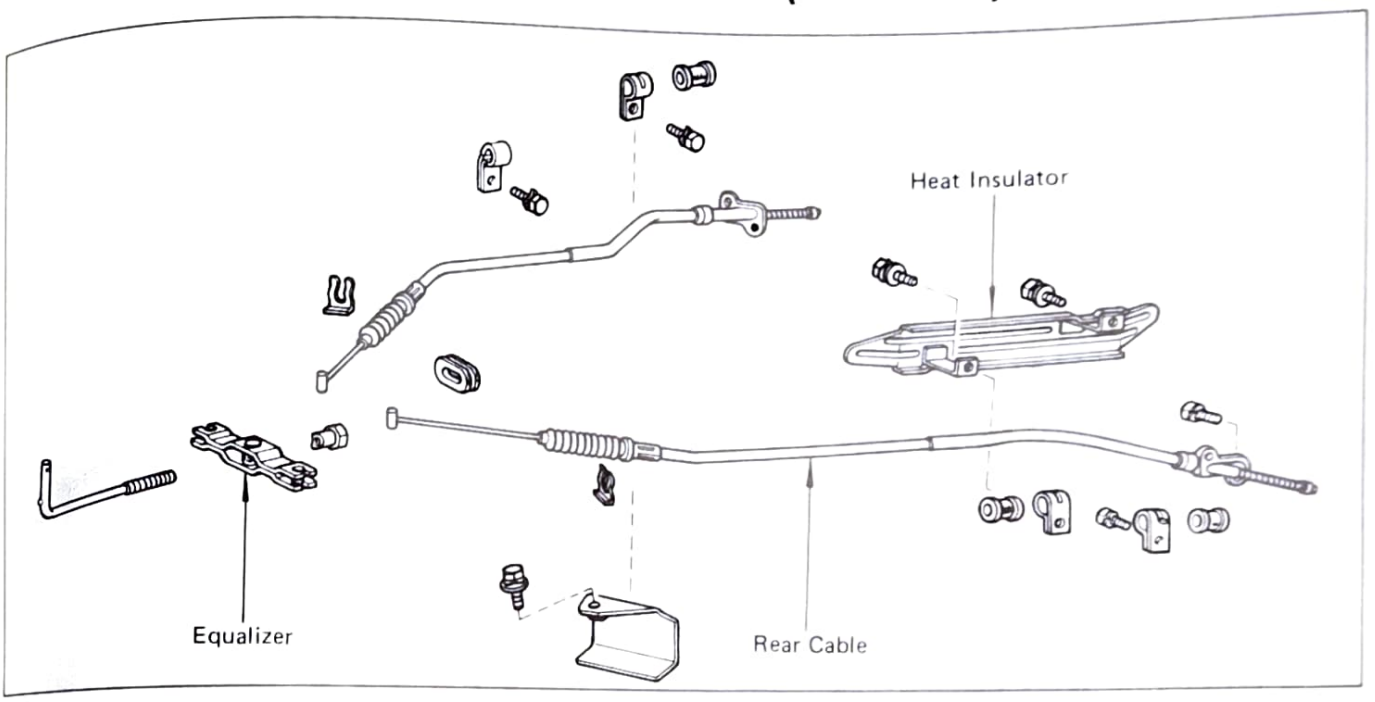
4. INSTALL PULLEY BRACKET

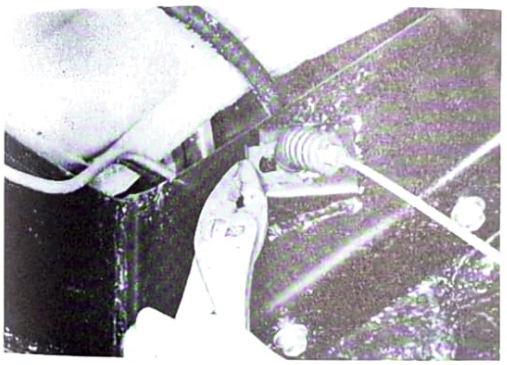
5. INSTALL PARKING BRAKE INDICATOR LIGHT SWITCH

6. CONNECT FRONT CABLE TO INTERMEDIATE LEVER

7. ADJUST PARKING BRAKE (See page 15-5)

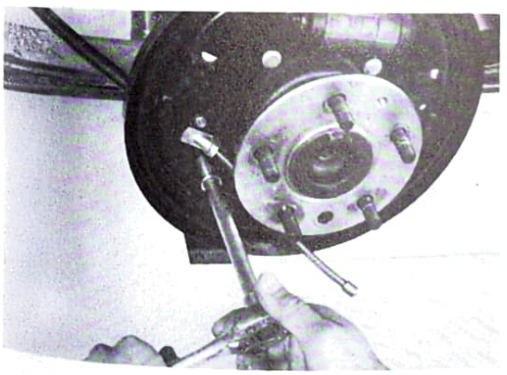
Rear Cable (RN 4×2)





REMOVAL OF REAR CABLE

1. DISCONNECT REAR CABLE FROM EQUALIZER
2. REMOVE CLIP AND CLAMPS

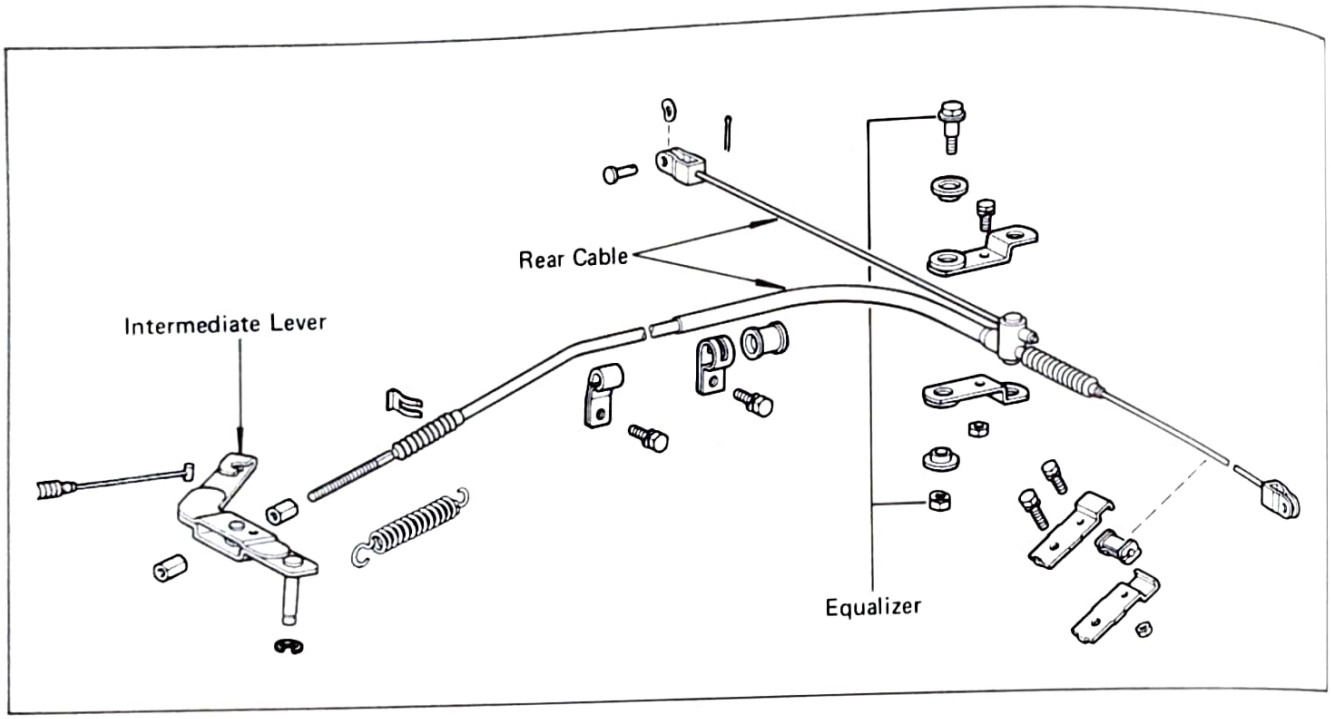


3. DISASSEMBLE REAR BRAKES AND DISCONNECT REAR CABLE FROM LEVER (See page 15-27 or 15-32)
4. REMOVE REAR CABLE FROM BACKING PLATE

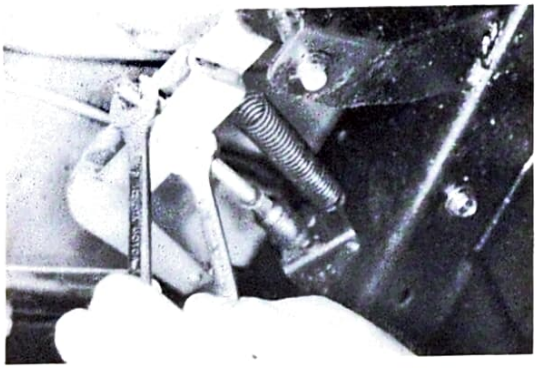
INSTALLATION OF REAR CABLE

1. INSTALL REAR CABLE TO BACKING PLATE
2. CONNECT REAR CABLE TO LEVER AND ASSEMBLE REAR BRAKES (See page 15-29 or 15-35)
3. INSTALL CLIP AND CLAMPS
4. CONNECT REAR CABLE TO EQUALIZER
5. ADJUST PARKING BRAKE (See page 15-5)

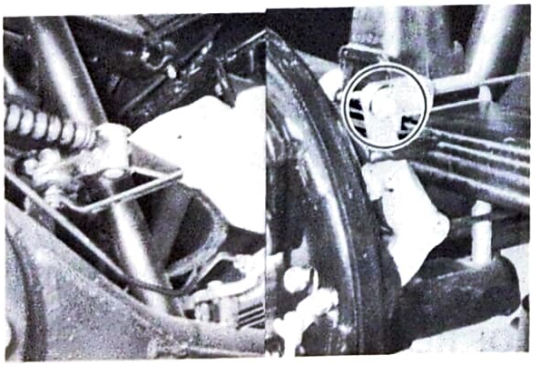
Rear Cable (RN 4×4)



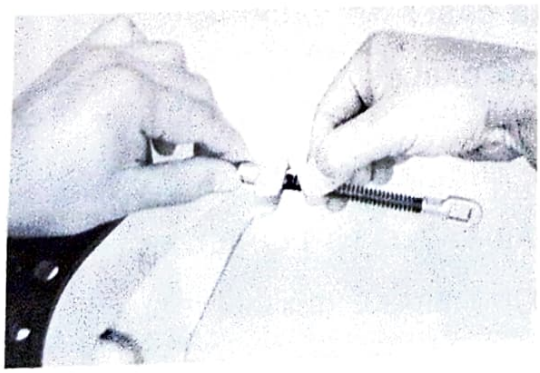
REMOVAL OF REAR CABLE



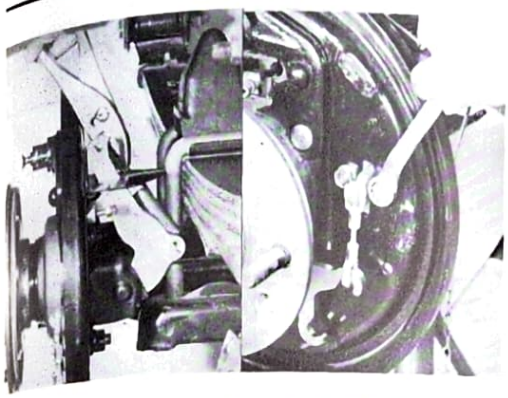
1. DISCONNECT REAR CABLE FROM INTERMEDIATE LEVER
2. REMOVE CLIP AND CLAMPS



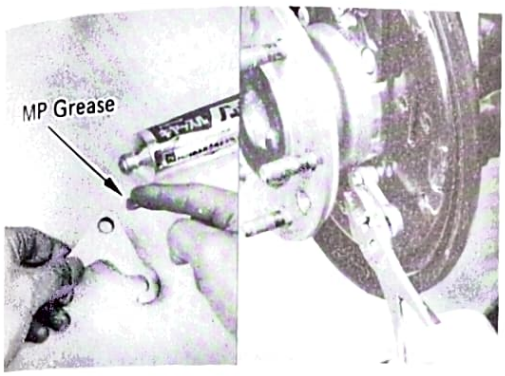
3. REMOVE EQUALIZER AND CABLE GUIDE FROM REAR AXLE HOUSING
4. DISCONNECT REAR CABLE FROM BELLCRANK



5. DISASSEMBLE REAR BRAKES AND REMOVE WIRE FROM LEVER (See page 15-38)



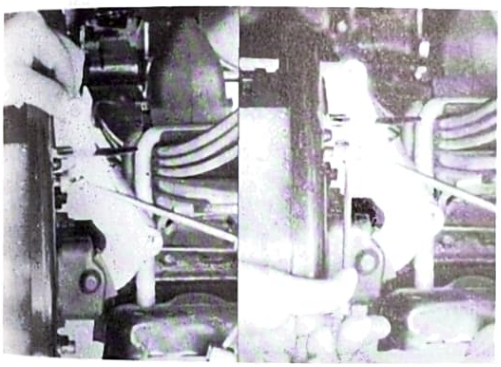
6. REMOVE FRONT AND REAR BELLCRANKS
   (a) Remove the spring from the rear bellcrank.
   (b) Remove the two bellcranks and the wire.



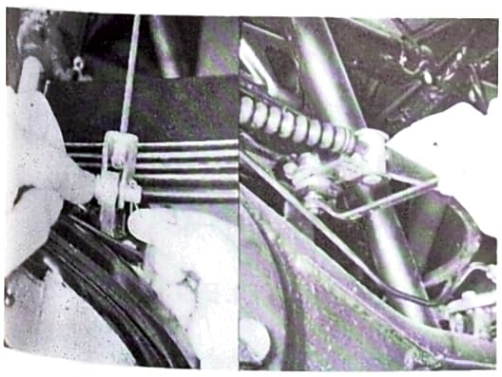
INSTALLATION OF REAR CABLE
(See illustration on page 15-48)

1. INSTALL FRONT AND REAR BELLCRANKS
   (a) Coat the front bellcrank with multipurpose grease.
   (b) Using pliers, install the front bellcrank.
   (c) Install the wire, rear bellcrank and spring.

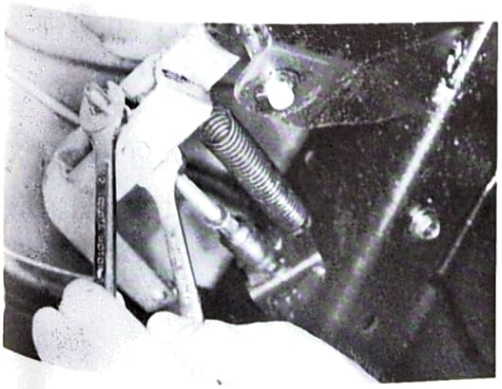
2. ASSEMBLE REAR BRAKE (See page 15-41)



3. ADJUST REAR BELLCRANK STOPPER SCREW
   (a) Tighten the bellcrank stopper screw until the play of the rear brake links become zero, and then loosen the screw one turn.
   (b) Tighten the screw lock nut.



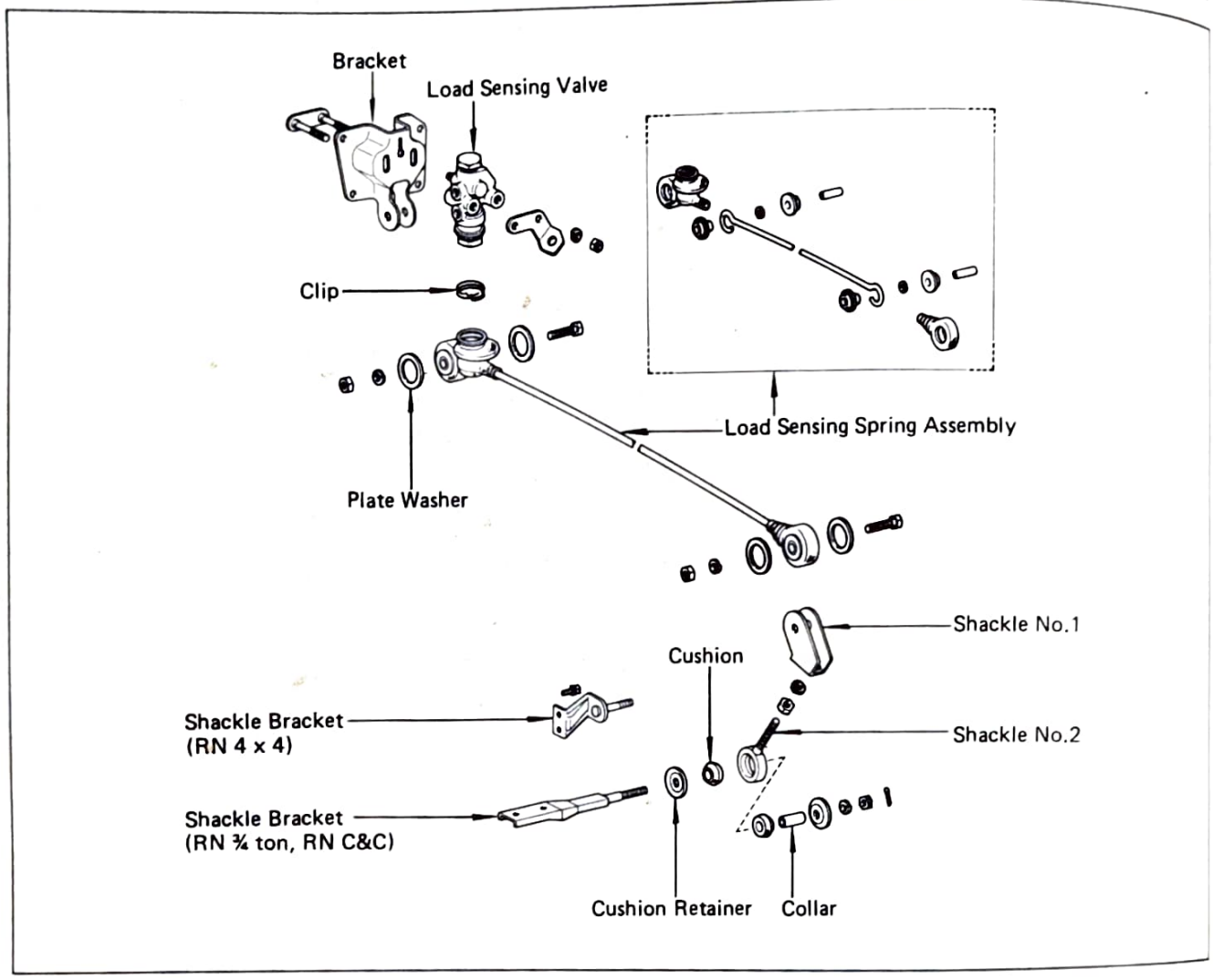
4. INSTALL REAR CABLE
   (a) Connect the rear cable to the rear bellcrank.
   (b) Install the equalizer and cable guide to the rear axle housing.

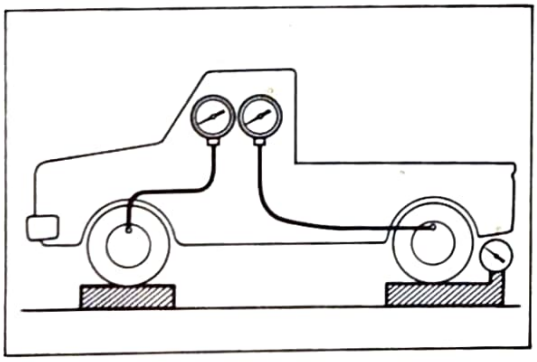


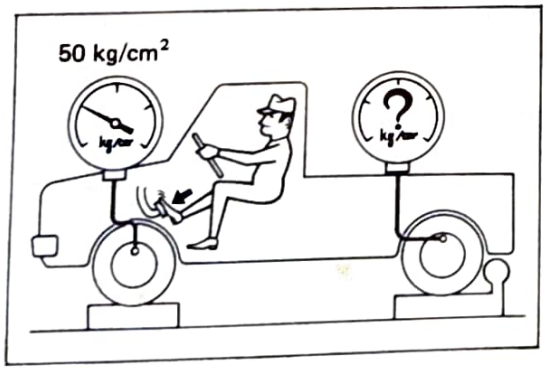
   (c) Connect the rear cable to the intermediate lever.
   (d) Install the clip and clamps.

5. ADJUST PARKING BRAKE (See page 15-5)

LSPV (LOAD SENSING PROPORTIONING VALVE)







CHECK AND ADJUSTMENT OF FLUID PRESSURE

1. SET REAR AXLE LOAD

   Rear axle load (include vehicle weight):

RN 3/4 ton, RN C&C	600 kg (1,323 lb)
RN 4 x 4	650 kg (1,433 lb)

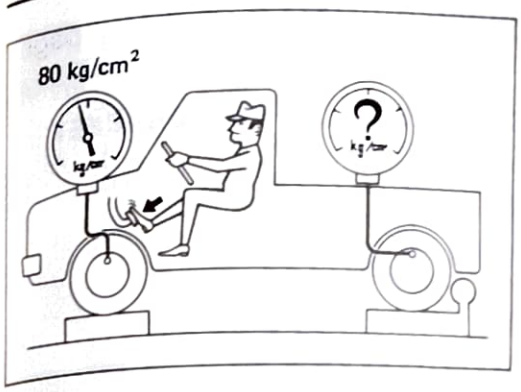
2. INSTALL LSPV GAUGE* AND BLEED AIR

   *SST 09705-29017

3. RAISE FRONT BRAKE PRESSURE TO 50 kg/cm² (711 psi) AND CHECK REAR BRAKE PRESSURE

   Rear brake pressure: 33 ± 5 kg/cm² (469 ± 71 psi)

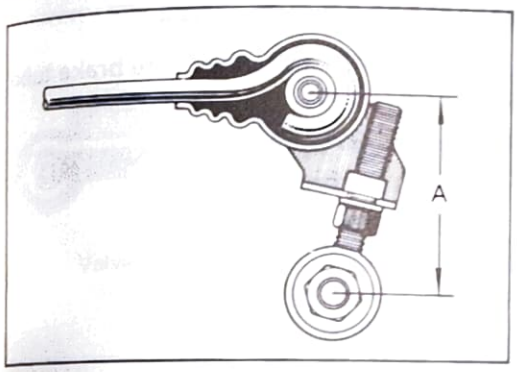
   NOTE: Brake pedal should not be depressed twice and/or returned while setting to the specified pressure.
   Read the value of rear brake pressure two seconds after adjusting the specified fluid pressure.



4. RAISE FRONT BRAKE PRESSURE TO 80 kg/cm² (1,138 psi) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure: 44 ± 7 kg/cm² (626 ± 100 psi)

If the rear brake pressure is incorrect, adjust the fluid pressure.



5. IF NECESSARY, ADJUST FLUID PRESSURE

(a) Adjust the length of the No.2 shackle.

Low pressure —— Lengthen A
High pressure —— Shorten A

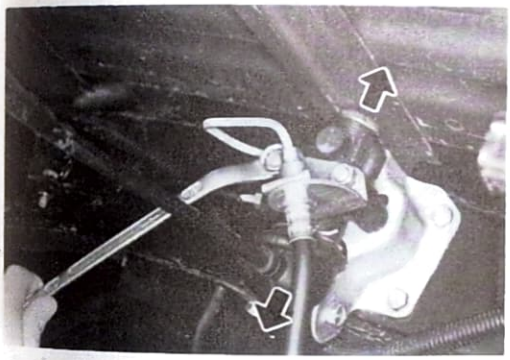
Initial set:

RN 4x2 78 mm (3.07 in.)
RN 4x4 120 mm (4.72 in.)

Adjusting range:

RN 4x2 72 – 84 mm (2.83 – 3.31 in.)
RN 4x4 114 – 126 mm (4.49 – 4.96 in.)

NOTE: One turn of the No.2 shackle changes the fluid pressure about 0.6 kg/cm² (8.5 psi).



(b) In event pressure cannot be adjusted by the No.2 shackle, raise or lower the valve body.

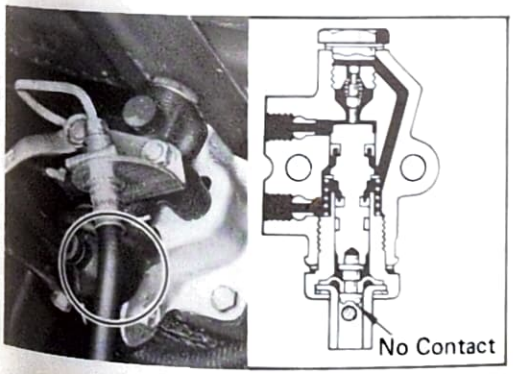
Low pressure —— Lower
High pressure —— Raise

(c) Torque the nuts.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

(d) Adjust the length of the No. 2 shackle again.

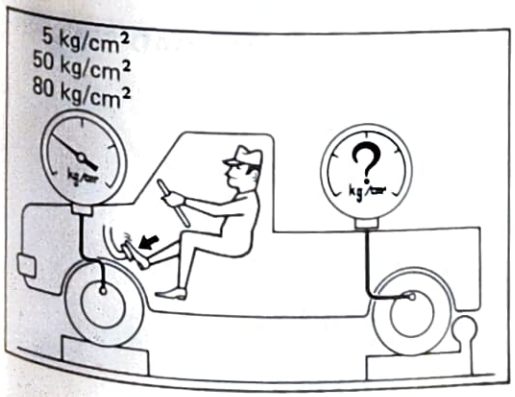
If it cannot be adjusted, inspect the valve housing.



6. IF NECESSARY, CHECK VALVE BODY

(a) Assemble the valve body in the uppermost position.

NOTE: When the brakes are applied, the piston will move down about 1 mm (0.04 in.). Even at this time, the piston should not contact or move the load sensing spring.

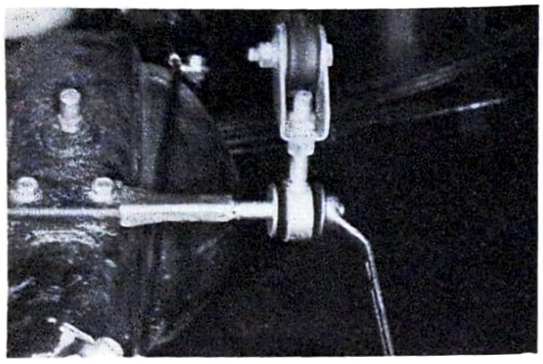


(b) In this position, check the rear brake pressure.

kg/cm² (psi)

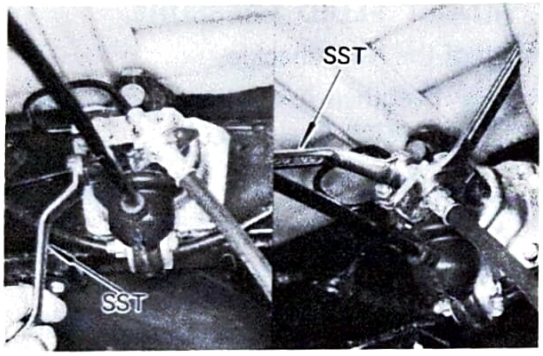
Front brake pressure	Rear brake pressure
5 (71)	5 (71)
50 (711)	19.7 – 23.7 (280 – 337)
80 (1,138)	29.8 – 35.8 (424 – 509)

If the measured value is not within standard, replace the valve body.

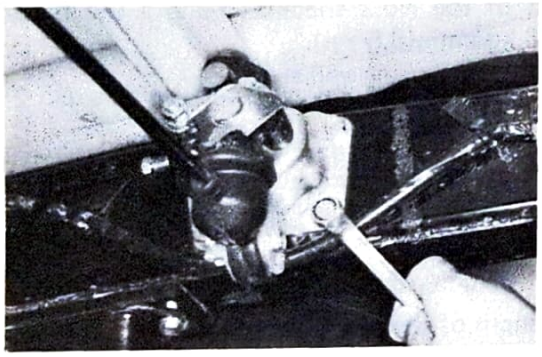


REMOVAL OF LSPV (See illustration on page 15-50)

1. DISCONNECT SHACKLE NO. 2 FROM BRACKET

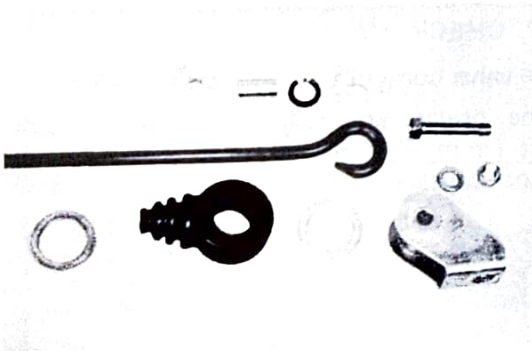


2. DISCONNECT BRAKE TUBE AND HOSE
   (a) Using a flare nut wrench*, disconnect the brake tube and hose from the valve body.
   *SST 09751-36011 or Commercial wrench
   (b) Remove the clip from the brake hose.

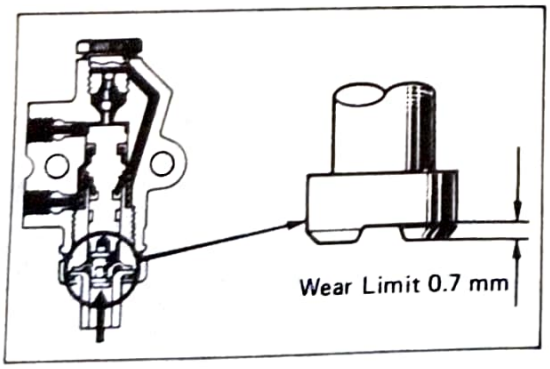


3. REMOVE LSPV ASSEMBLY
   Remove the valve bracket mounting bolts and remove the LSPV assembly.

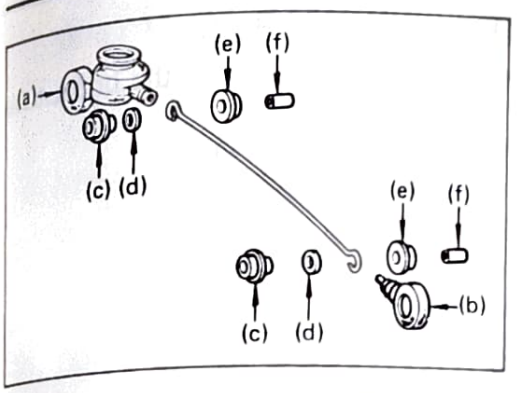
INSPECTION LSPV



1. INSPECT LSPV PARTS FOR DAMAGE OR RUST



2. INSPECT VALVE PISTON PIN AND LOAD SENSING CONTACT SURFACE FOR WEAR
   Wear limit: 0.7 mm (0.028 in.)

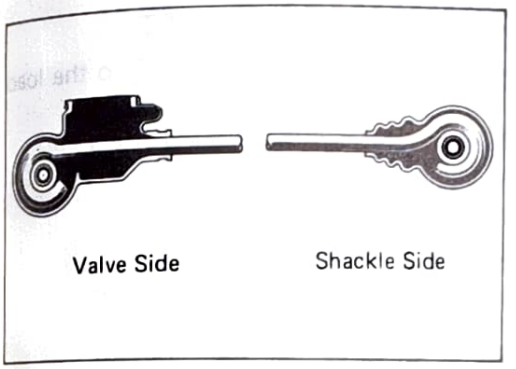


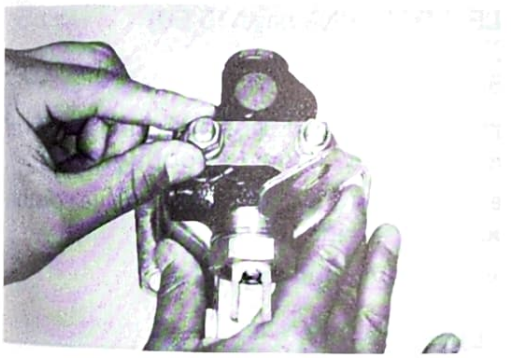
INSTALLATION OF LSPV (See illustration on page 15-50)

1. ASSEMBLE FOLLOWING PARTS TO LOAD SENSING SPRING
   - (a) Load sensing valve boot
   - (b) Load sensing spring boot
   - (c) Bushings
   - (d) Rubber plates
   - (e) Bushings
   - (f) Collars

   NOTE:
   Apply rubber grease to all rubbing areas.

   Do not mistake the valve side for the shackle side of the load sensing spring.

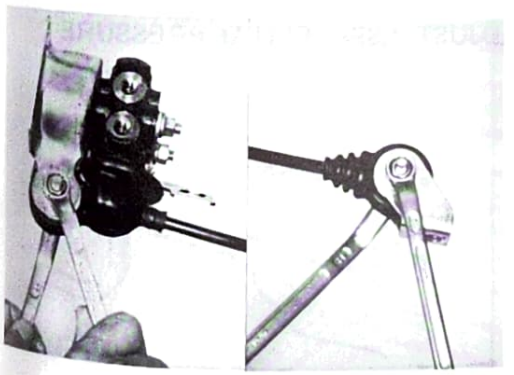




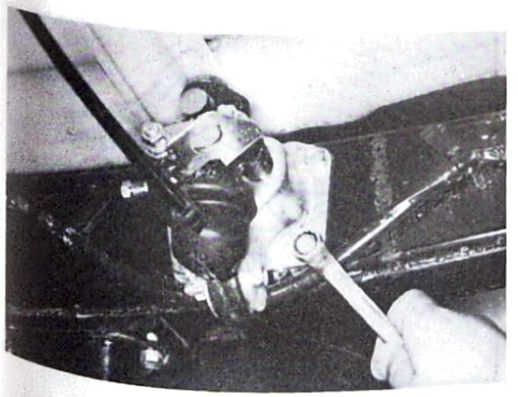
2. ASSEMBLE VALVE BODY TO BRACKET

   Assemble the valve body to the valve body bracket together with the brake hose bracket

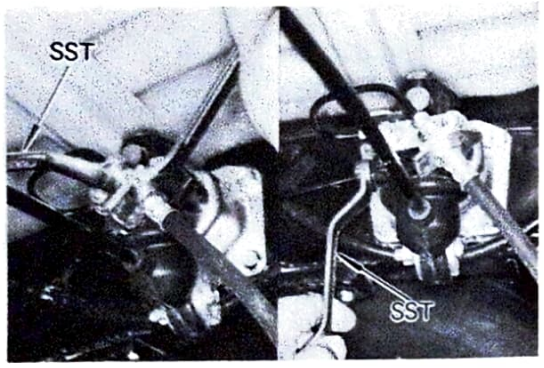
   NOTE: Fingertighten the valve body mounting nuts.



3. CONNECT VALVE BODY AND NO.1 SHACKLE TO LOAD SENSING SPRING



4. INSTALL LSPV ASSEMBLY TO FRAME

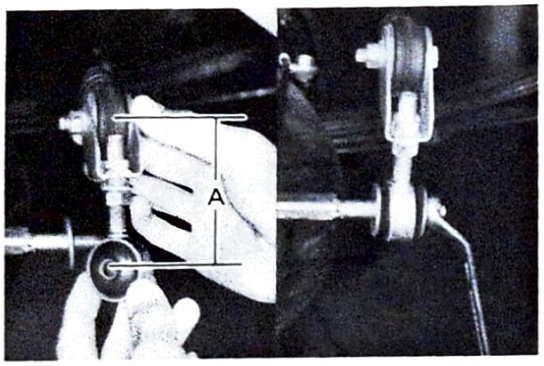


5. CONNECT BRAKE TUBE AND HOSE

(a) Using a flare nut wrench*, connect the brake tube and hose.

*SST 09751-36011 or Commercial wrench

(b) Install the clip to the brake hose.



6. CONNECT SHACKLE NO. 2 TO BRACKET

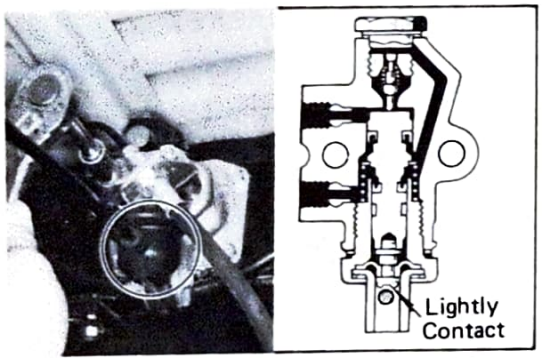
(a) Install shackle No. 1 and shackle No. 2 to the load sensing spring.

(b) Set the dimension A by turning shackle No. 2.

Initial set:

RN 4x2 78 mm (3.07 in.)
RN 4x4 120 mm (4.72 in.)

(c) Connect shackle No. 2 to the shackle bracket.



7. SET REAR AXLE LOAD **(See page 15-50)**

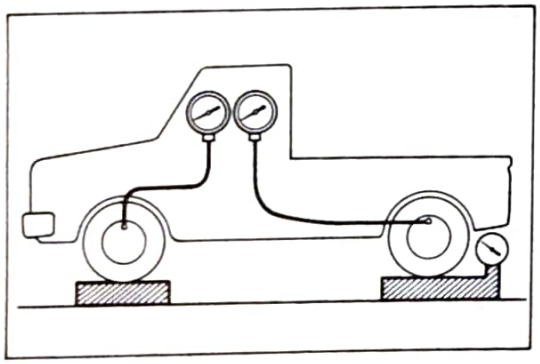
8. SET VALVE BODY

(a) When pulling down the load sensing spring, confirm that the valve piston moves down smoothly.

(b) Position the valve body so that the valve piston lightly contacts load sensing spring.

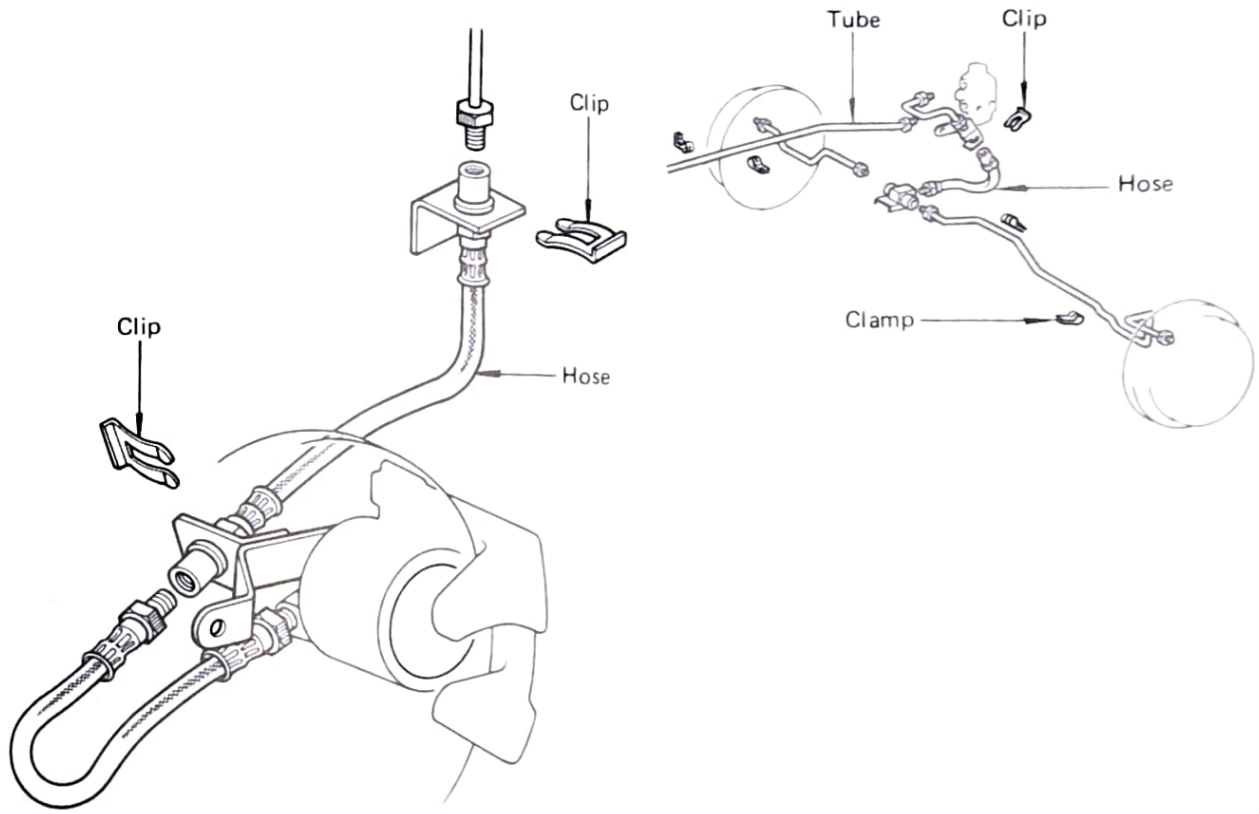
(c) Tighten the valve body mounting nuts.

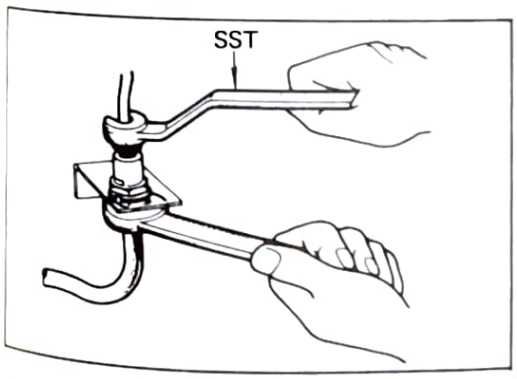
9. BLEED BRAKE LINE



10. CHECK AND ADJUST LSPV FLUID PRESSURE **(See page 15-50)**

BRAKE HOSES AND TUBES

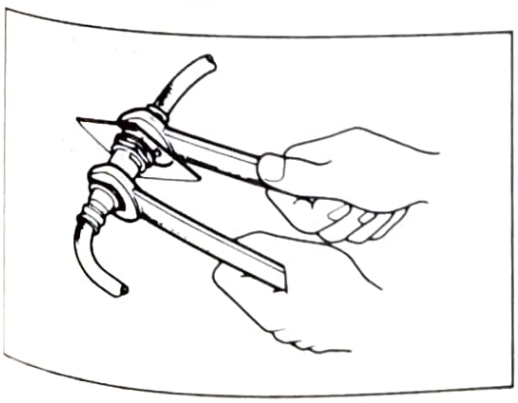




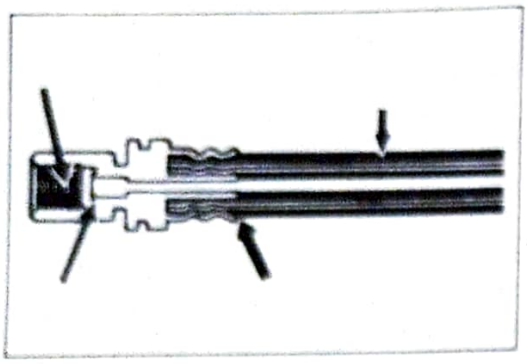
DISCONNECTING OF BRAKE HOSES AND TUBES

1. DISCONNECT HOSE AND TUBE
   (a) Remove the clip.
   (b) Using a wrench to hold the hose, and a flare nut wrench* to hold the tube, disconnect the tube and hose.

   *SST 09751-36011 or Commercial wrench



2. DISCONNECT TWO HOSES
   (a) Remove the clip.
   (b) Using two wrenches, disconnect two hoses.

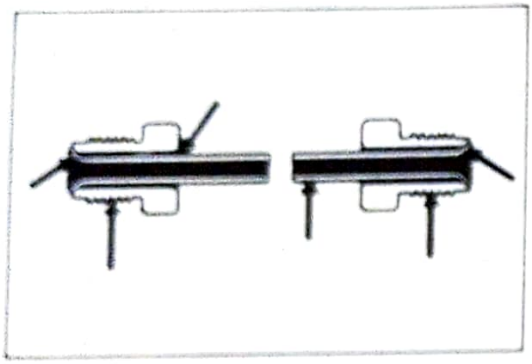


INSPECTION OF BRAKE HOSES AND TUBES

1. INSPECT BRAKE HOSES

(a) Inspect the hose for damage, cracks or swelling.

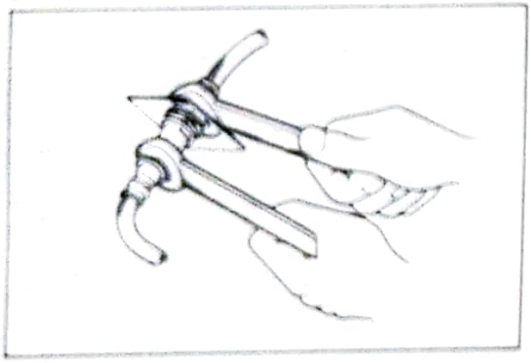
(b) Inspect the threads for damage.



2. INSPECT BRAKE TUBES

(a) Inspect the tube for damage, cracks, dents or corrosion.

(b) Inspect the threads for damage.



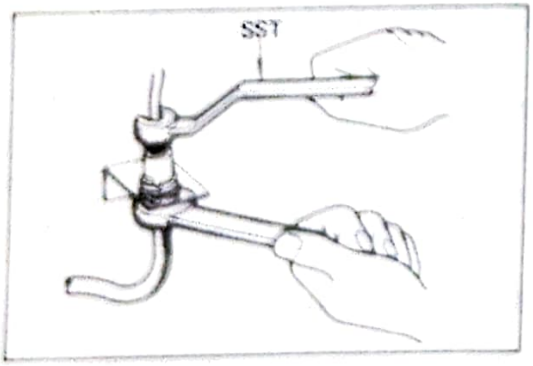
CONNECTING OF BRAKE HOSES AND TUBES

1. CONNECT TWO HOSES

Using two wrenches, connect the two hoses. Torque the connection.

Torque: 2.0 – 2.7 kg-m (15 – 19 ft-lb)

NOTE: All hoses must be free from excessive bending, twisting and pulling.



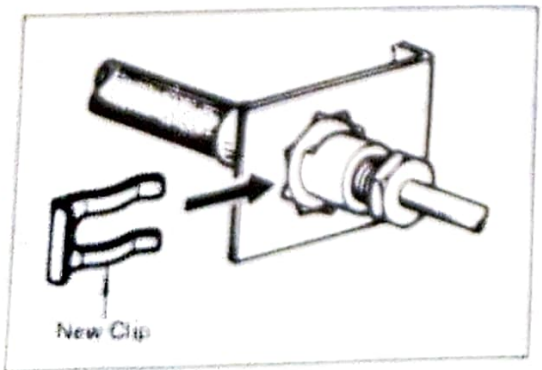
2. CONNECT HOSE AND TUBE

Using a wrench to hold the hose, and a flare nut wrench* to hold the tube, connect the tube and hose.
Torque the connection.

*SST 09751-36011 or Commercial wrench

Torque: 1.3 – 1.8 kg-m (10 – 13 ft-lb)

NOTE: Place the tube through the center of the grommet.



3. INSTALL NEW HOSE CLIP AND TUBE CLAMP

4. CHECK BRAKE HOSES AND TUBES

Check that the brake hoses and tubes have clearance from contacting sharp edges, moving components and the exhaust pipe.

5. BLEED BRAKE SYSTEM (See page 15-6)

STEERING

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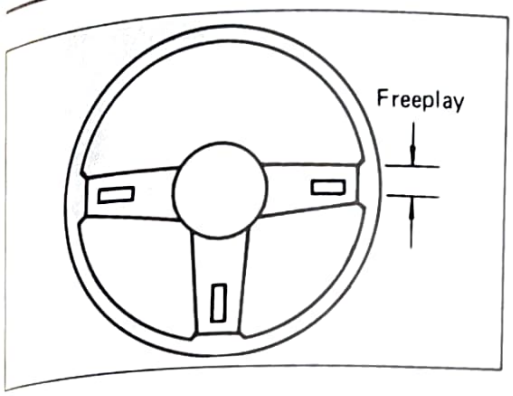
Tie Rod	16-78
Steering Damper	16-78
Drag Link	16-79
Knuckle Arm	16-79

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard steering	Tires improperly inflated	Inflate tires to proper pressure	13-3, 28
	Power steering belt loose	Tighten belt	16-59
	Oil level in reservoir low	Check reservoir	16-3
	Insufficient lubricant	Lubricate suspension and steering linkage	2-12
	Excessive caster	Check front end alignment	13-3, 28
	Steering linkage worn or bent	Check linkage	16-73, 77
	Ball joints worn	Replace ball joints	13-23
	Steering knuckle bearing worn	Replace knuckle bearing	13-40
	Steering column binding	Inspect steering column	16-4, 13
	Steering gear out of adjustment or broken	Adjust or repair steering gear	16-3
	Power steering unit faulty	Check power steering unit	16-48
Poor return	Tires improperly inflated	Inflate tires to proper pressure	13-3, 28
	Insufficient lubricant	Lubricate suspension and steering linkage	2-12
	Wheel alignment incorrect	Check front end alignment	13-3, 28
	Steering column binding	Inspect steering column	16-4, 13
	Steering gear out of adjustment or broken	Adjust or repair steering gear	16-3
Excessive play	Tie rods or linkage worn	Inspect linkage	16-73, 77
	Steering gear loose	Tighten gear bolts	
	Steering shaft coupling worn	Inspect coupling	16-4, 13
	Ball joints worn	Replace ball joints	13-23
	Steering knuckle bearing worn	Replace knuckle bearing	13-40
	Steering gear out of adjustment or broken	Adjust or repair steering gear	16-3

SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Steering wheel puller	09609-20010	To remove steering wheel
Tie rod end puller	09611-20014	To disconnect relay rod
Pitman arm puller	09610-55012	To remove pitman arm
Bearing lock nut wrench	09617-30040 or Commercial	To remove worm bearing lock nut
Bearing adjusting screw wrench	09616-30020 or Commercial	To remove worm bearing adjusting screw
Bearing puller	09612-30012 or Commercial	To remove worm bearing outer race
Bearing driver	09612-30012 or Commercial	To install worm bearing outer race
Worm bearing adjusting socket	09616-00010 or 00002-00800	To measure worm bearing preload
Bearing puller	09612-65013 or Commercial	To remove worm bearing outer race
Bearing driver	09608-35013 or Commercial	To install worm bearing outer race
Bushing driver	09307-12010 or Commercial	To replace sector shaft bushing
Flare nut wrench	09631-22020 or Commercial	To loosen and tighten pressure and return lines
Power steering pump gauge	00001-00008	To measure steering fluid pressure
Power steering overhaul tool set	09630-00010 or 00002-00800	To overhaul vane pump and gear housing
Bearing driver	09631-60010	To install gear housing bearing and teflon ring (RN 4x4)
Tie rod end puller	09611-22011	To disconnect tie rod
Tie rod end puller	09611-22011	To disconnect shimmy damper



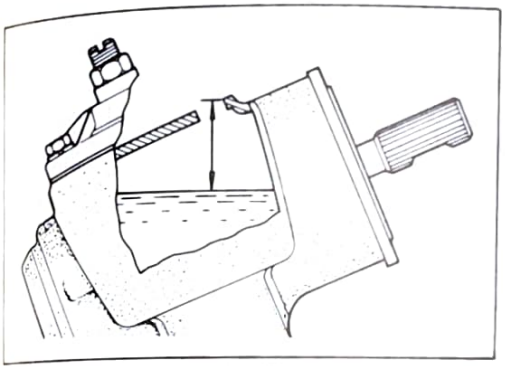
STEERING CHECK

1. CHECK THAT STEERING WHEEL FREEPLAY IS CORRECT

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure. Freeplay should not exceed the maximum limit.

Maximum play: 30 mm (1.18 in.)

If incorrect, adjust or repair as required.



2. CHECK STEERING GEAR BOX OIL LEVEL

Oil level:

RN 4x2	**18 – 28 mm (0.71 – 1.10 in.) from top**
RN 4x4	**12 – 17 mm (0.47 – 0.67 in.) from top**

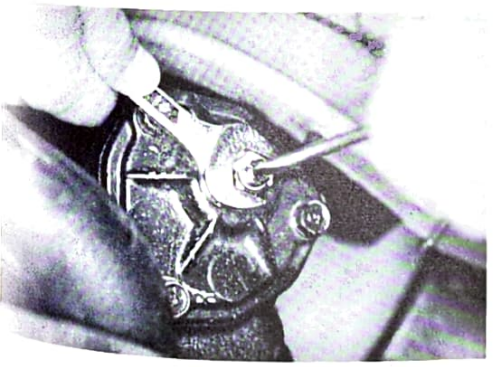
If low, fill with gear oil and check for oil leaks.

ADJUSTMENT OF STEERING FREEPLAY

1. LIFT AND SUPPORT FRONT END

Raise the vehicle enough to lift the front wheels off the ground.

2. POINT WHEELS STRAIGHT AHEAD



3. ADJUST STEERING GEAR BOX

(a) Loosen the lock nut.

(b) Turn the adjusting screw clockwise to decrease wheel freeplay and counterclockwise to increase it.

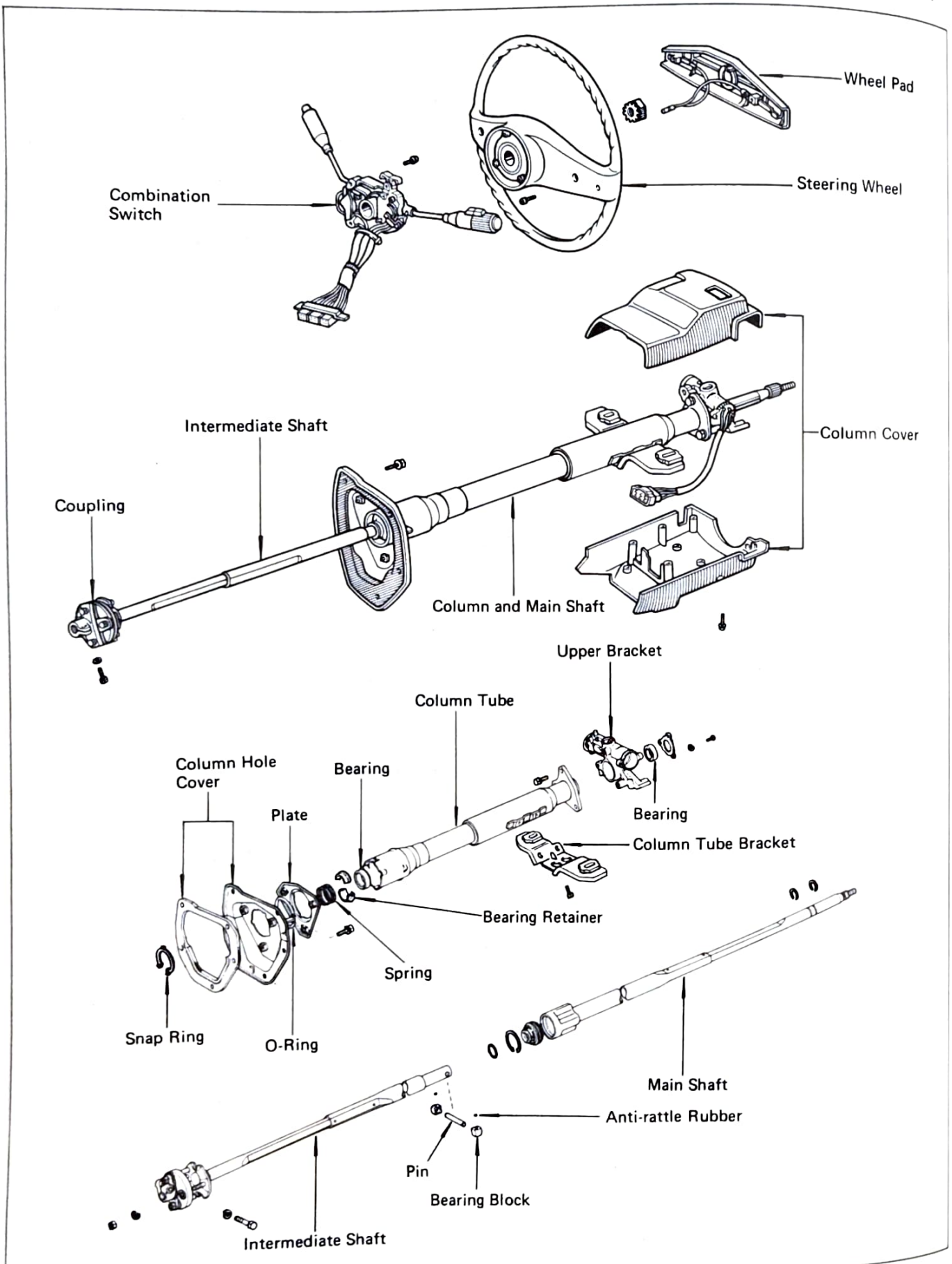
NOTE: Turn the adjusting screw in small increments and check wheel freeplay between small adjustments.

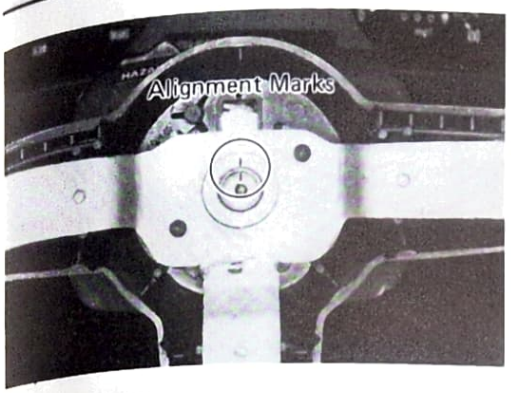
4. CHECK THAT STEERING DOES NOT BIND

Turn the steering wheel half way around in both directions. Check that the freeplay is correct and steering is smooth and without rough spots.

5. HOLD ADJUSTING SCREW AND TIGHTEN LOCK NUT

STEERING MAIN SHAFT (RN 4x2)





REMOVAL OF STEERING MAIN SHAFT

1. REMOVE NEGATIVE CABLE FROM BATTERY

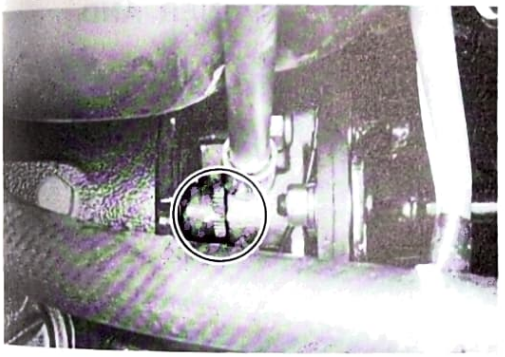
2. REMOVE STEERING WHEEL
   (a) Remove horn button screws on the back of the steering wheel and pull off the button.
   (b) Place alignment marks on the steering wheel and shaft to ensure correct reassembly.
   (c) Remove the steering wheel nut.

   (d) Using a steering wheel remover*, remove the steering wheel.

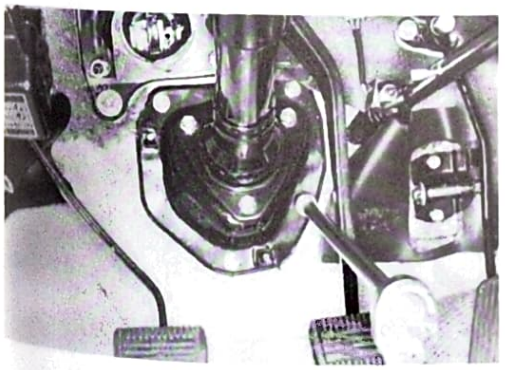
   *SST 09609-20010

3. REMOVE STEERING LOWER COVER AND UPPER COVER

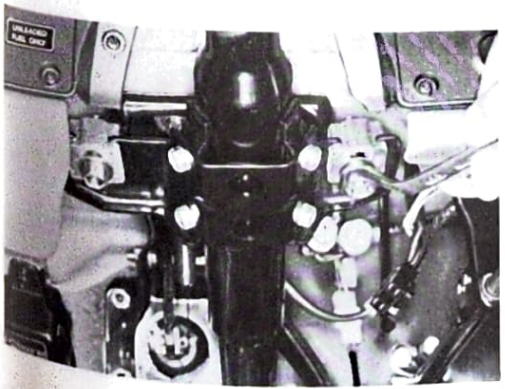
4. REMOVE COMBINATION SWITCH



5. REMOVE COUPLING BOLT
   (a) Place an alignment mark on the coupling and worm shaft to ensure correct reassembly.
   (b) Loosen the coupling bolt.

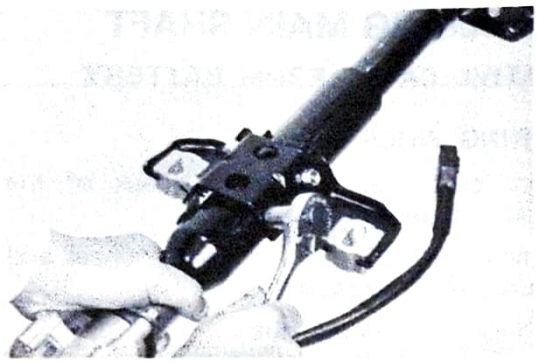


6. REMOVE FIVE MOUNTING BOLTS FROM COLUMN HOLE COVER

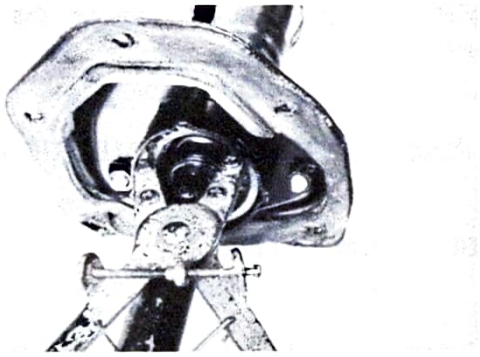


7. REMOVE COLUMN BRACKET MOUNTING BOLTS AND PULL OUT MAIN SHAFT
   (a) Remove two bracket mounting bolts.
   (b) Carefully pull out the main shaft with the intermediate shaft.

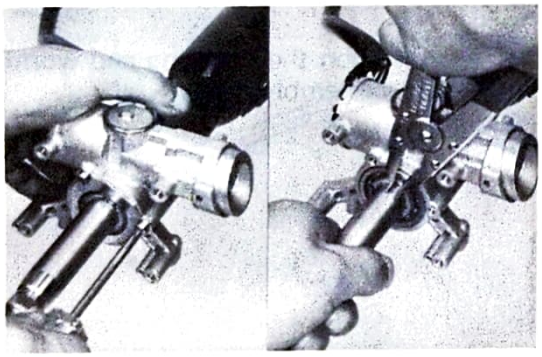
DISASSEMBLY OF STEERING MAIN SHAFT



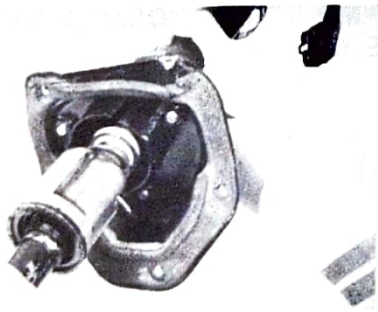
1. REMOVE STEERING COLUMN BRACKET



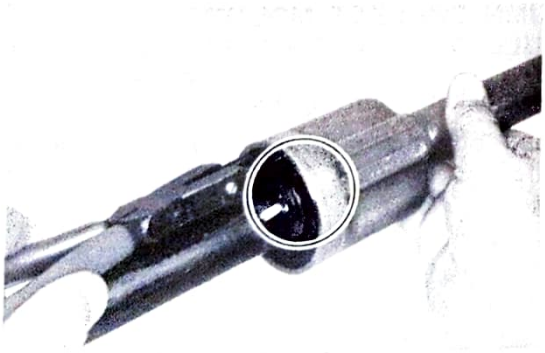
2. REMOVE SNAP RING FROM COLUMN TUBE



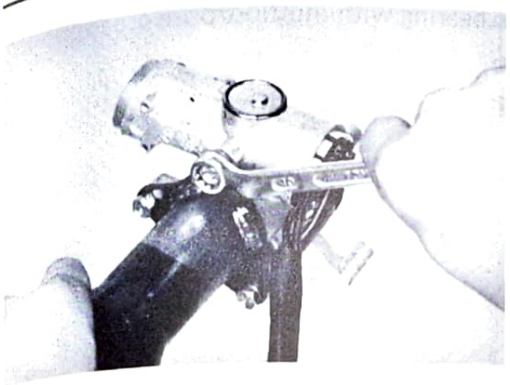
3. REMOVE UPPER BEARING RETAINER AND SNAP RING
   (a) Remove the bearing retainer from the upper bracket.
   (b) Using snap ring pliers, remove the snap ring.



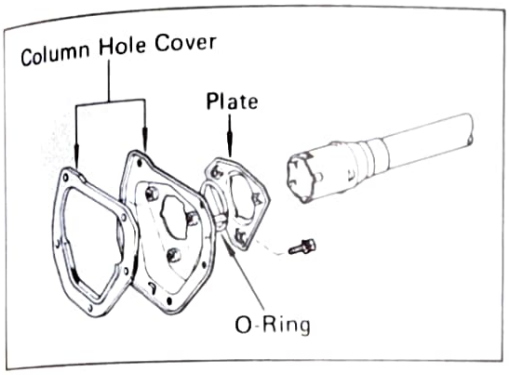
4. PULL OUT STEERING MAIN SHAFT TOGETHER WITH INTERMEDIATE SHAFT



5. REMOVE INTERMEDIATE SHAFT FROM MAIN SHAFT
   (a) Place an alignment mark on the main shaft and intermediate shaft.
   (b) Using snap ring pliers, remove the snap ring.
   (c) Pull the intermediate shaft out of the main shaft.



6. REMOVE UPPER BRACKET FROM COLUMN TUBE



7. REMOVE COLUMN HOLE COVER FROM COLUMN TUBE

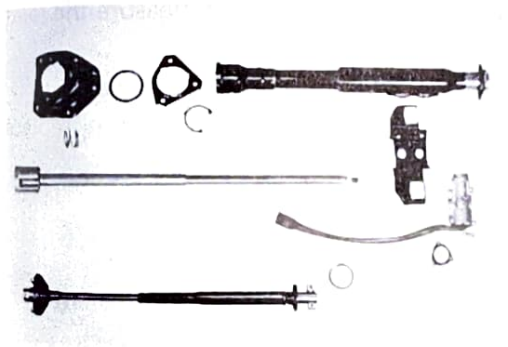
Remove the following parts from the column tube.

(a) Column hole cover

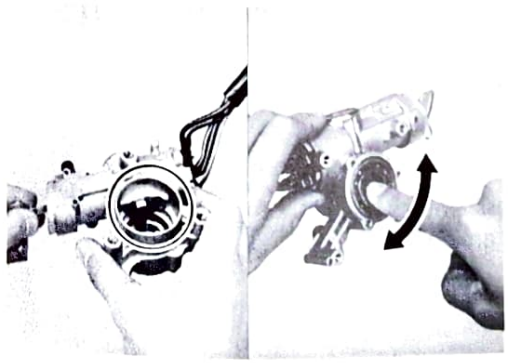
(b) O-ring

(c) Plate

INSPECTION AND REPAIR OF STEERING MAIN SHAFT



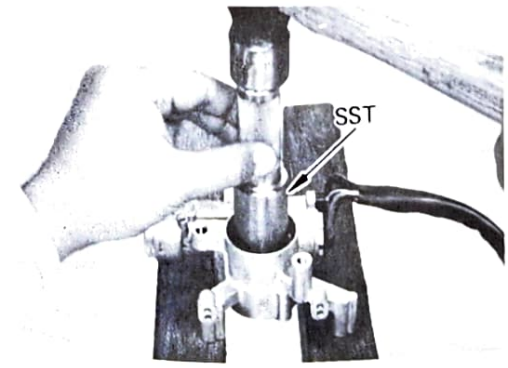
1. CHECK ALL PARTS FOR WEAR OR DAMAGE



2. CHECK THAT STEERING LOCK MECHANISM OPERATES PROPERLY

3. CHECK BEARING ROTATION CONDITION

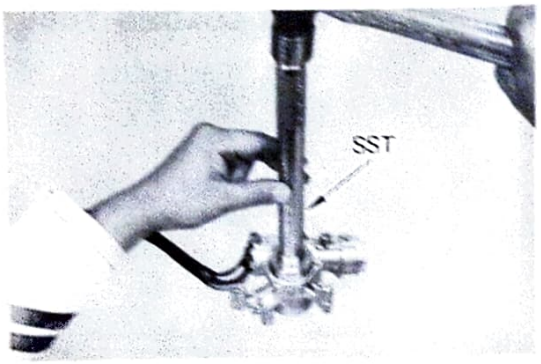
If the bearing does not rotate smoothly, replace the bearing.



4. IF NECESSARY, REPLACE BEARING

(a) Using a driver*, remove the bearing.

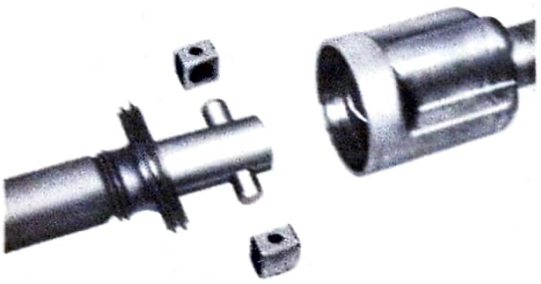
*SST 09620-30010 or Commercial driver



(b) Coat the new bearing with multipurpose grease.

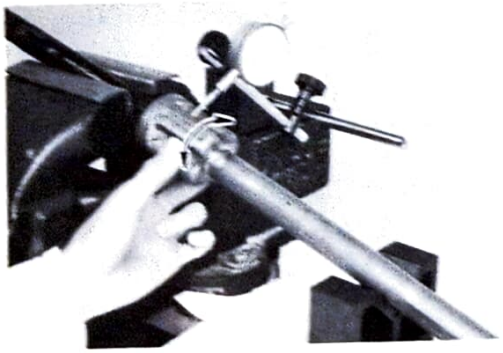
(c) Using a driver*, install the new bearing.

*SST 09620-30010 or Commercial driver



5. INSPECT TRUNNION JOINT

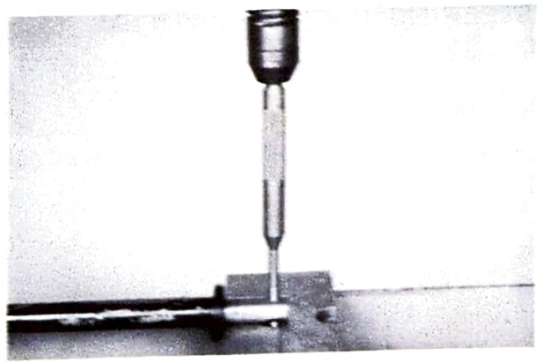
(a) Check the point parts for wear or damage.



(b) Temporarily assemble the joint and measure the joint radial play with a dial indicator.

Maximum radial play: 0.06 mm (0.0024 in.)

If the joint radial play is greater than maximum, replace the joint parts.



6. IF NECESSARY, REPLACE TRUNNION JOINT PARTS

(a) Using a press, remove the pin from the intermediate shaft.

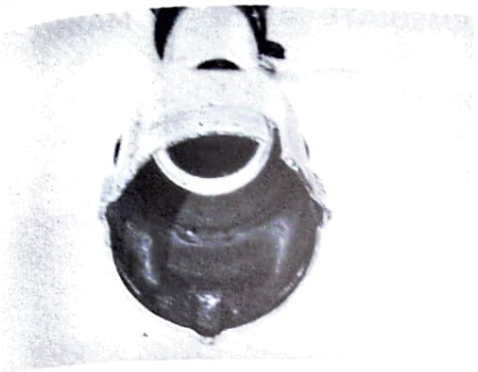
(b) Replace the boot with a new one.

(c) Using a press, install the pin to the shaft until both protrusions are equal.

(d) Select a bearing block that will allow minimum radial play.

Bearing block width

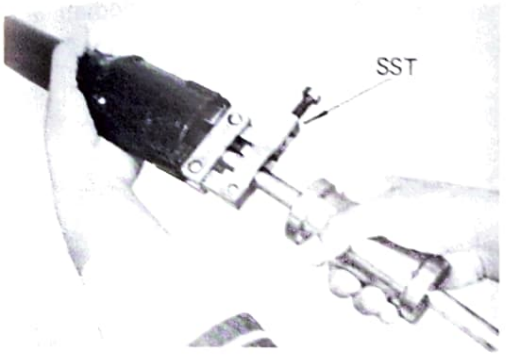
Punch mark	Part No.	Width mm (in.)
Yes	45224-30040	15.97–16.00 (0.6287–0.6299)
No	45225-30040	16.00–16.03 (0.6299–0.6311)



7. INSPECT MAIN SHAFT LOWER BEARING

Check the lower bearing for wear or damage.

If the bearing is damaged or worn, replace it.



8. IF NECESSARY, REPLACE MAIN SHAFT LOWER BEARING

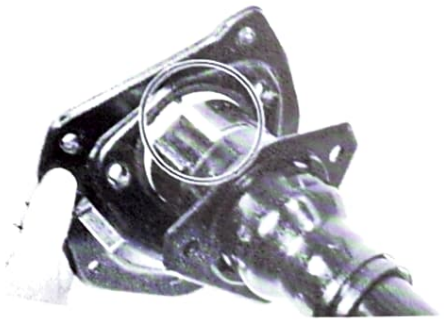
(a) Using a puller*, remove the lower bearing from the column tube.

*SST 09308-00010 or Commercial puller

(b) Apply multipurpose grease to the bearing.

(c) Using a drift, drive the bearing into the column tube.

ASSEMBLY OF STEERING MAIN SHAFT (See illustration on page 16-4)



1. INSTALL COLUMN HOLE COVER TO COLUMN TUBE

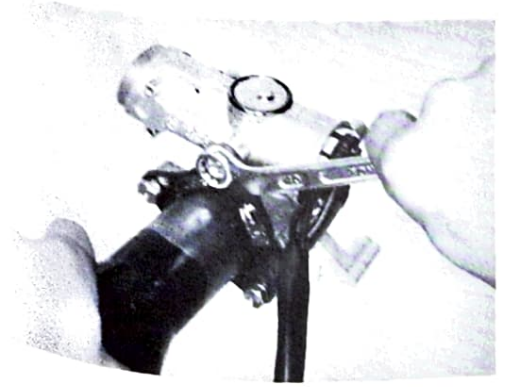
Install the following parts on the column tube.

(a) Plate

(b) O-ring

(c) Column hole cover

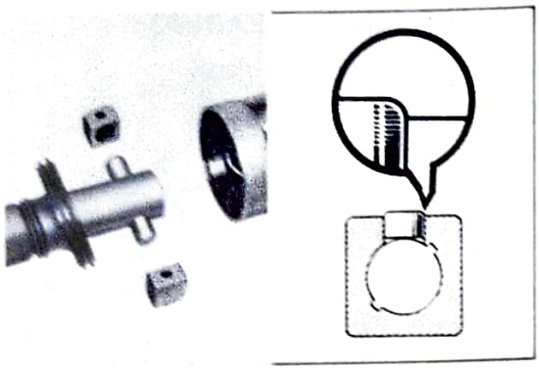
NOTE: Align the protrusion so that it fits into the column tube groove.



2. INSTALL UPPER BRACKET TO COLUMN TUBE

Install the upper bracket and tighten the bolts.

Torque: 0.4 – 0.7 kg-m (35 – 60 in.-lb)

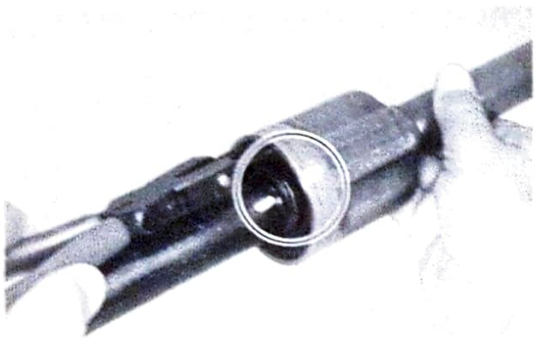


3. INSTALL INTERMEDIATE SHAFT TO MAIN SHAFT

(a) Coat molybdenum disulphide lithium base grease to the bearing blocks and inner main shaft housing

(b) Install the bearing blocks on the intermediate shaft.

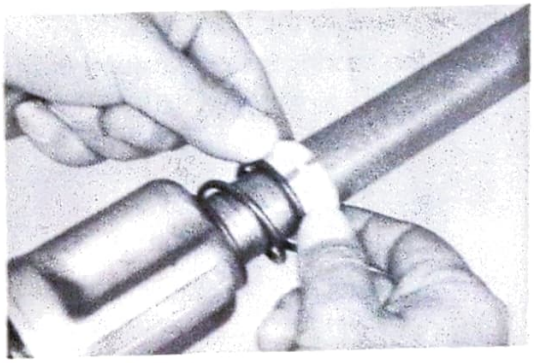
(c) Insert the antirattle rubbers in the bearing blocks with the chamfered edge facing outward.



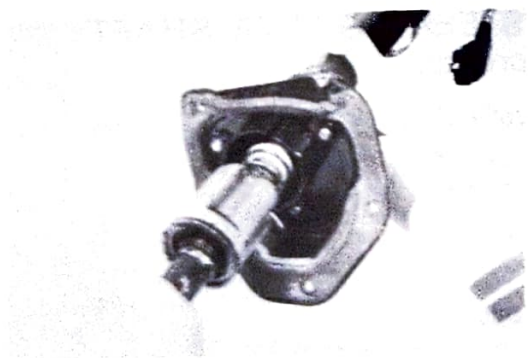
(d) Align the matching marks on the intermediate shaft and main shaft.

(e) Insert the intermediate shaft in the main shaft housing with the antirattle rubbers positioned at right angle to the shaft and both facing same direction.

(f) Push in the boot and install the snap ring with snap ring pliers.

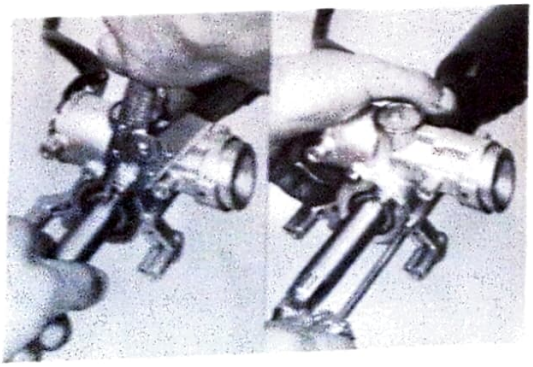


4. INSTALL SPRING AND SPRING RETAINER TO MAIN SHAFT



5. INSERT MAIN SHAFT IN COLUMN TUBE

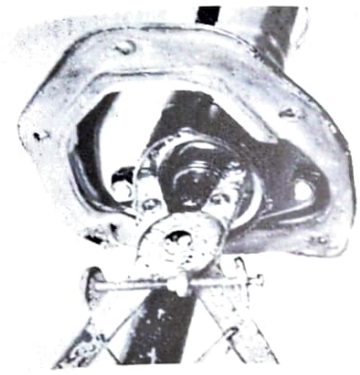
Push the main shaft into the column tube.



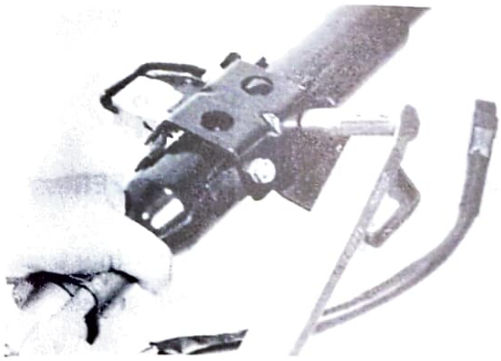
6. INSTALL SNAP RING AND BEARING RETAINER

(a) Using snap ring pliers, install the snap ring.

(b) Install the upper bearing retainer.



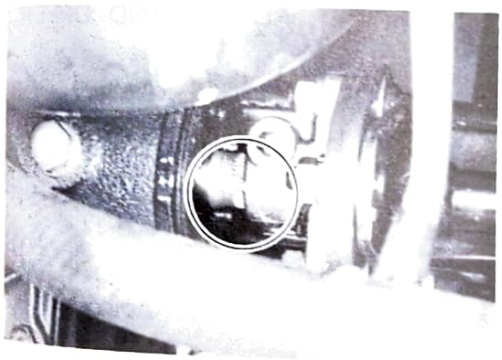
7. INSTALL SNAP RING TO COLUMN TUBE



8. INSTALL COLUMN TUBE BRACKET

Tighten the column tube bracket mounting bolts.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



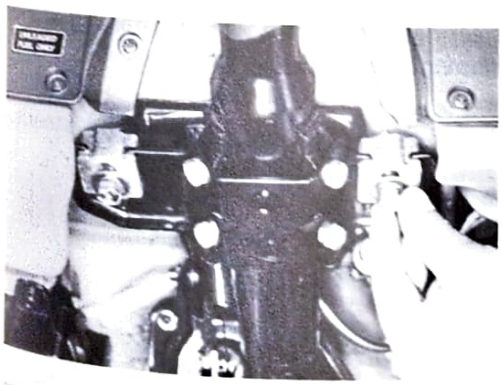
INSTALLATION OF STEERING MAIN SHAFT

(See illustration on page 16-4)

1. PLACE COLUMN AND MAIN SHAFT IN INSTALLED POSITION

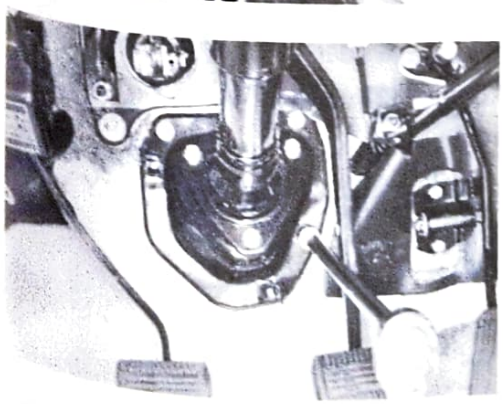
2. INSTALL COUPLING ON WORM SHAFT (RN 4x2)

Line up the marks on the coupling and worm shaft.



3. INSTALL COLUMN BRACKET MOUNTING BOLTS BY HAND

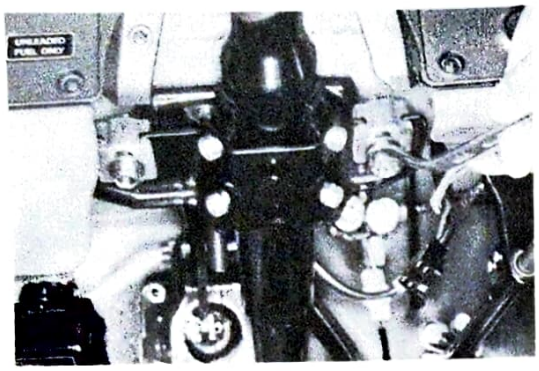
Install two bracket mounting bolts finger tight only.



4. INSTALL STEERING COLUMN HOLE COVER

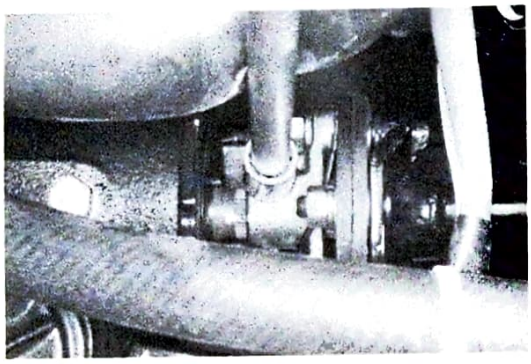
Tighten the bolts.

Torque: 0.6 – 0.9 kg-m (53 – 78 in.-lb)



5. TORQUE TWO COLUMN BRACKET MOUNTING BOLTS

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)



6. INSTALL COUPLING SET BOLT

Install and tighten the coupling set bolt.

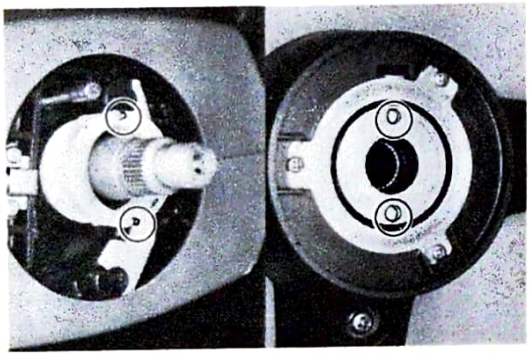
Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)

7. INSTALL COMBINATION SWITCH ON STEERING COLUMN SHAFT

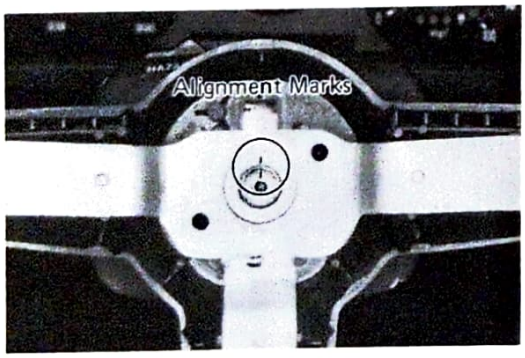
(a) Place the switch on the shaft and install four screws.

(b) Coat the horn contact plate with rubber grease.

(c) Connect the switch connector.



8. INSTALL STEERING LOWER COVER AND UPPER COVER

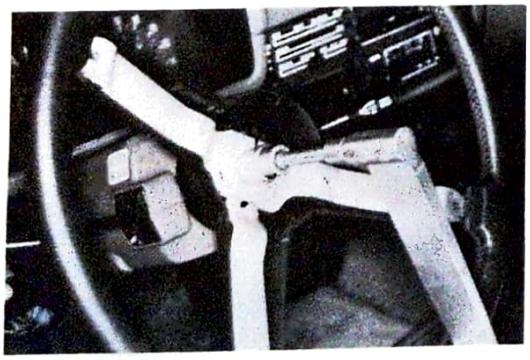


9. INSTALL STEERING WHEEL

(a) Align the auto-cancel switch with holes on the steering wheel.

(b) Install the steering wheel on the shaft, making sure to align the alignment marks.

(c) Check that the auto-cancel action is correct by operating the turn signal and turning the steering wheel until the turn signal switches off.



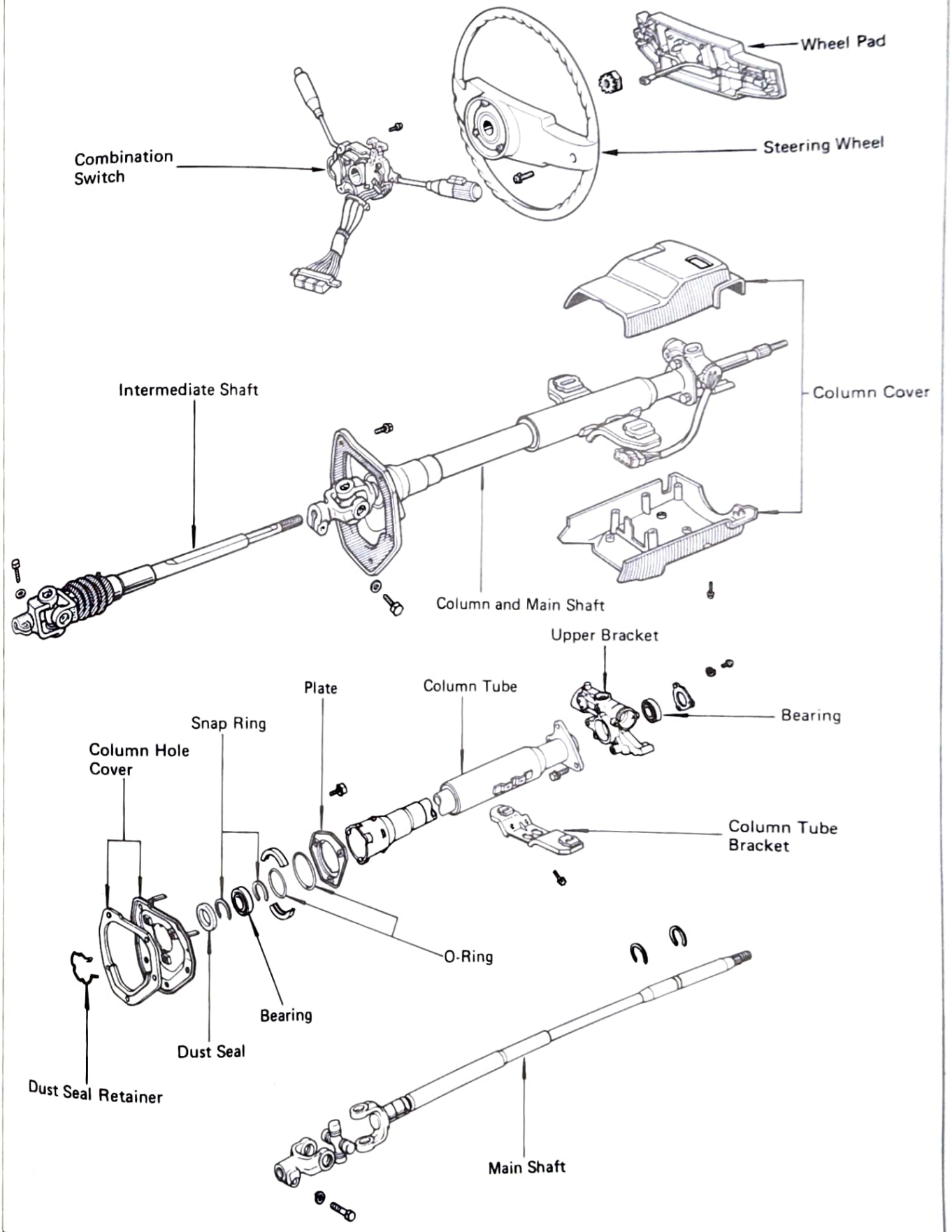
(d) Install and torque the steering wheel nut.

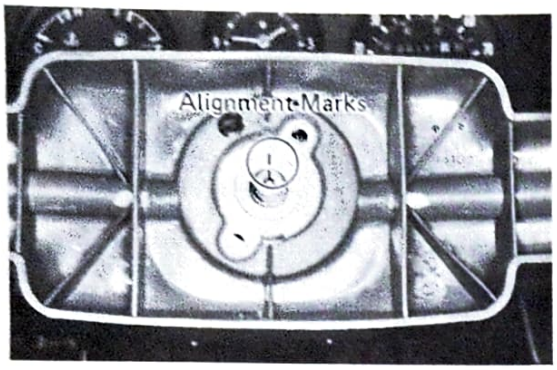
Torque: 3.0 – 4.0 kg-m (22 – 28 ft-lb)

(e) Install the horn button.

10. CONNECT NEGATIVE CABLE TO BATTERY

STEERING MAIN SHAFT (RN 4x4)





REMOVAL OF STEERING MAIN SHAFT

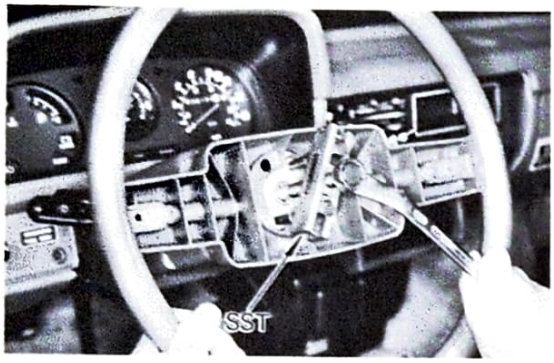
1. REMOVE NEGATIVE CABLE FROM BATTERY

2. REMOVE STEERING WHEEL

   (a) Remove horn button screws on the back of the steering wheel and pull off the button.

   (b) Place alignment marks on the steering wheel and shaft to ensure correct reassembly.

   (c) Remove the steering wheel nut.

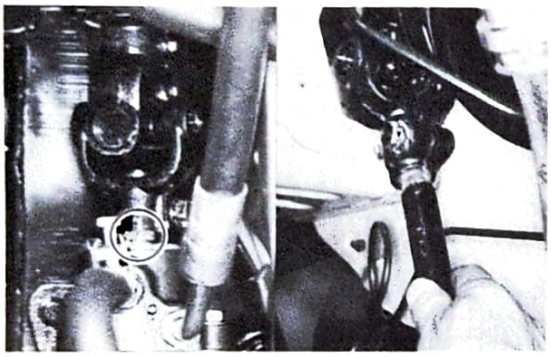


   (d) Using a steering wheel remover*, remove the steering wheel.

   *SST 09609-20010

3. REMOVE STEERING LOWER COVER AND UPPER COVER

4. REMOVE COMBINATION SWITCH

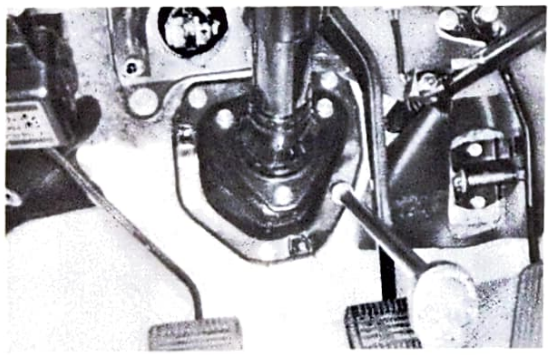


5. REMOVE INTERMEDIATE SHAFT

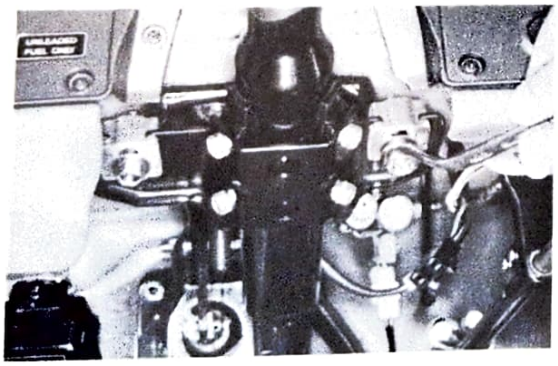
   (a) Place an alignment mark on the joint yoke and worm shaft to ensure correct reassembly.

   (b) Loosen the joint yoke bolts.

   (c) Compress and remove the intermediate shaft and remove it.

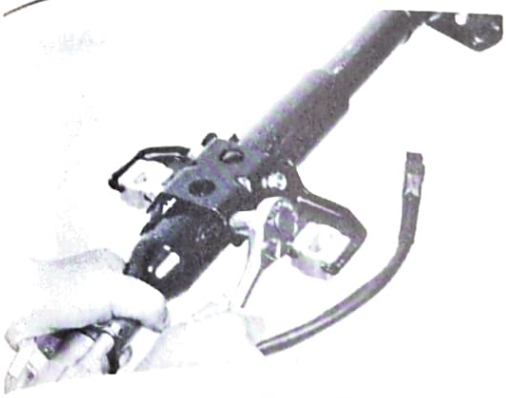


6. REMOVE FIVE MOUNTING BOLTS FROM COLUMN HOLE COVER



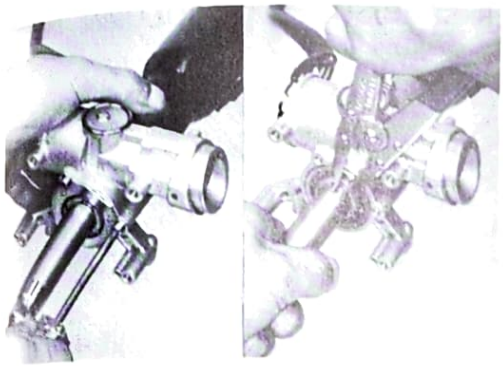
7. REMOVE COLUMN BRACKET MOUNTING BOLTS AND PULL OUT MAIN SHAFT

   Remove two bracket mounting bolts. Carefully pull out the main shaft.

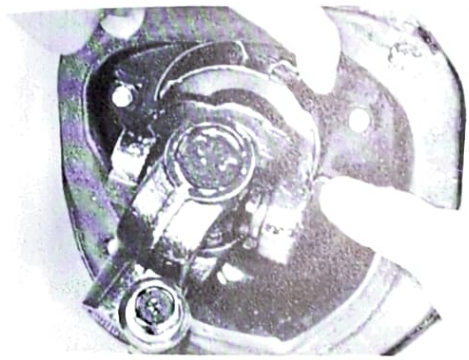


DISASSEMBLY OF STEERING MAIN SHAFT

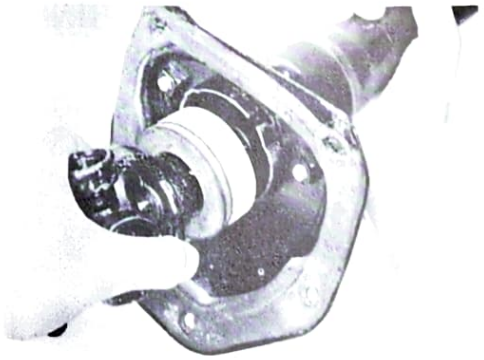
1. REMOVE STEERING COLUMN BRACKET



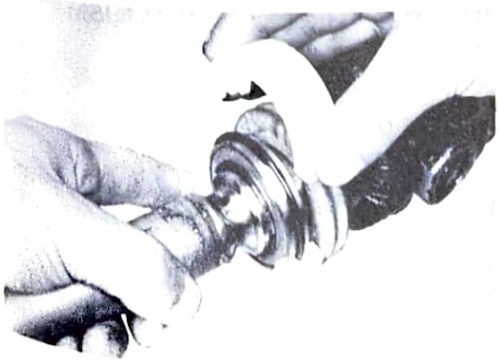
2. REMOVE UPPER BEARING RETAINER AND SNAP RING
   (a) Remove the bearing retainer from the upper bracket.
   (b) Using snap ring pliers, remove the snap ring.



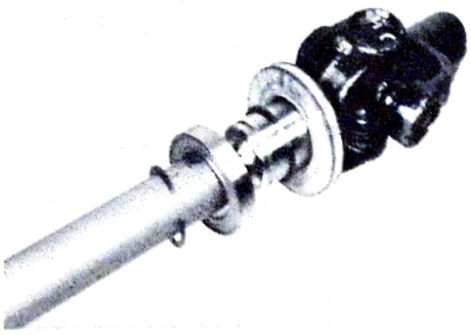
3. REMOVE DUST SEAL RETAINER



4. PULL OUT STEERING MAIN SHAFT

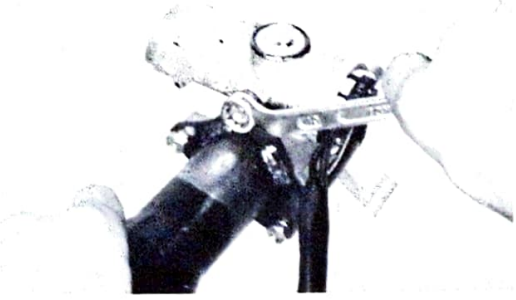


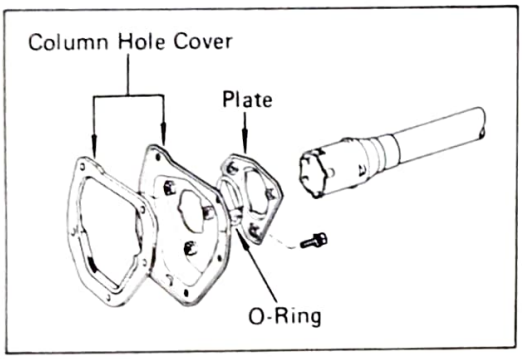
5. REMOVE LOWER BEARING SUPPORTS AND O-RING



6. REMOVE LOWER BEARING AND DUST SEAL
   (a) Using snap ring pliers, remove the snap ring.
   (b) Pull out the lower bearing from the main shaft.
   (c) Remove the other snap ring.
   (d) Remove the dust seal.

7. REMOVE UPPER BRACKET FROM COLUMN TUBE



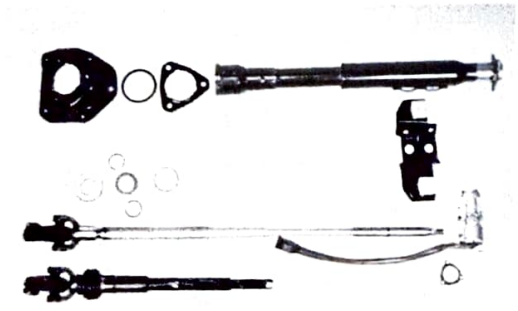


8. REMOVE COLUMN HOLE COVER FROM COLUMN TUBE

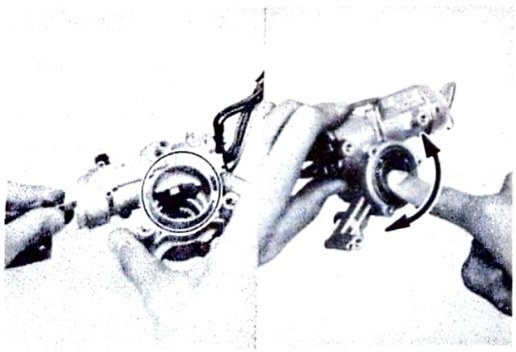
   Remove the follwing parts from the column tube.
   (a) Column hole cover
   (b) O-ring
   (c) Plate

INSPECTION AND REPAIR OF STEERING MAIN SHAFT

1. CHECK ALL PARTS FOR WEAR OR DAMAGE

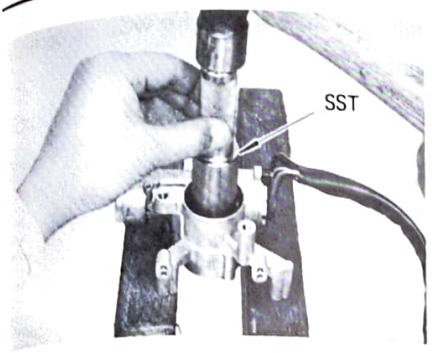


2. CHECK THAT STEERING LOCK MECHANISM OPERATES PROPERLY



3. CHECK BEARING ROTATION CONDITION

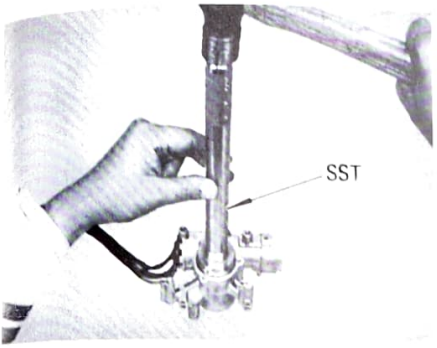
   If the bearing does not rotate smoothly, replace the bearing.



4. IF NECESSARY, REPLACE BEARING

(a) Using a driver*, remove the bearing.

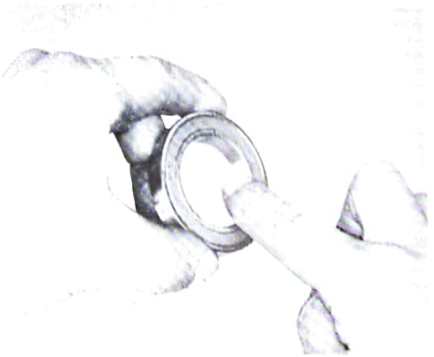
*SST 09620-30010 or Commercial driver



(b) Coat the new bearing with multipurpose grease.

(c) Using a driver*, install the new bearing.

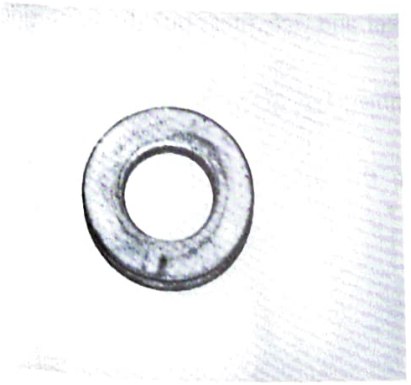
*SST 09620-30010 or Commercial driver



5. INSPECT MAIN SHAFT LOWER BEARING

Check the lower bearing for wear or damage.

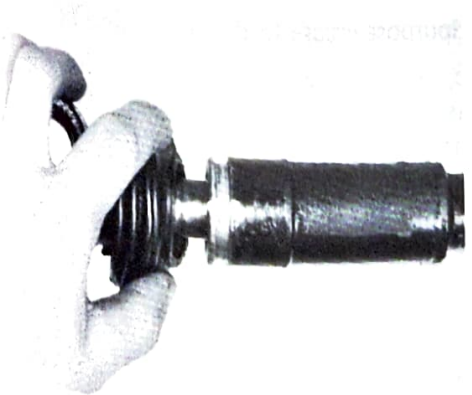
If the bearing is worn or damaged, replace it.



6. INSPECT DUST SEAL

Check the dust seal for wear or damage.

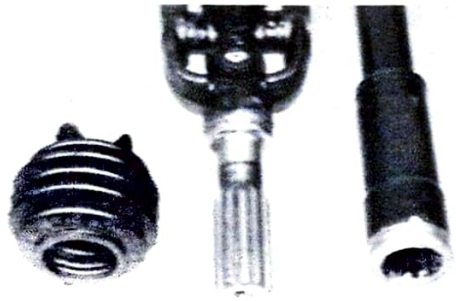
If the dust seal is worn or damaged, replace it.



7. INSPECT INTERMEDIATE SHAFT

(a) Place alignment marks on the yoke and shaft.

(b) Pull the yoke out of the shaft.



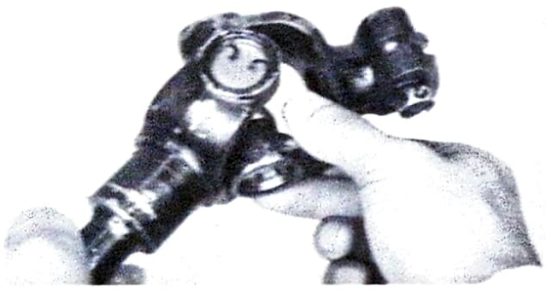
(c) Check the yoke and shaft splines for wear or damage.

(d) Check the boot for wear or damage.

(e) Coat the yoke spline and boot lip, with multipurpose grease.

(f) Align the matching marks on the yoke and shaft, and assemble the intermediate shaft.

8. INSPECT SPIDER BEARINGS (RN4 x 4)



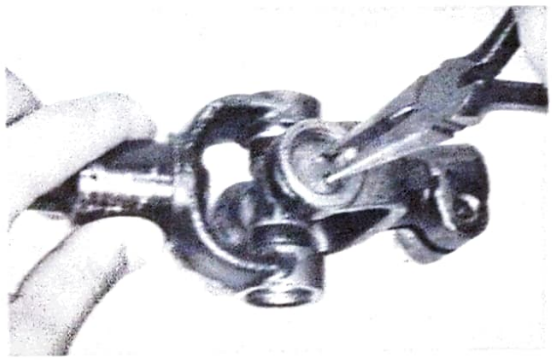
(a) Inspect the spider bearings for wear or damage.

(b) Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

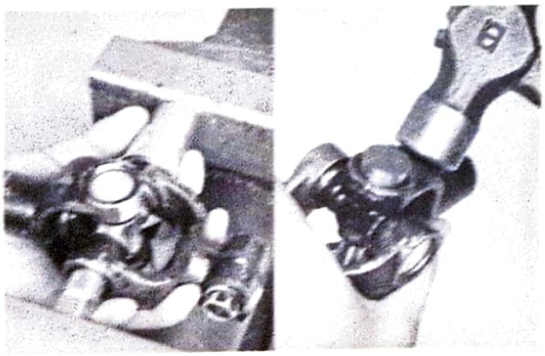
Bearing axial play: Less than 0.05 mm (0.0020 in.)

If necessary, replace the spider bearing.

9. IF NECESSARY, REPLACE SPIDER BEARING



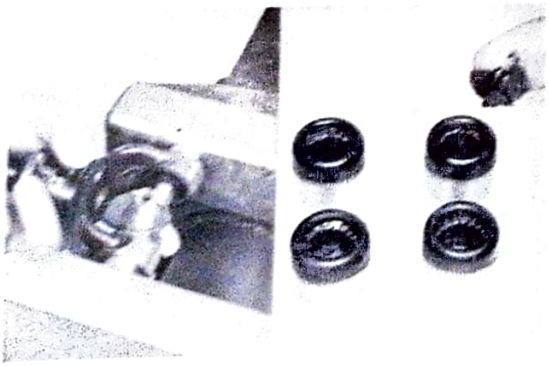
(a) Using needle nose pliers, remove the snap ring.



(b) Using a socket and vice, press out the yoke side outer race.

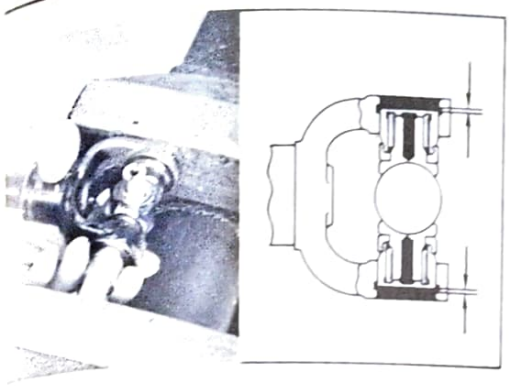
(c) Using a hammer, tap the yoke and remove the outer race.

NOTE: Remove the other bearing races by the same procedure.

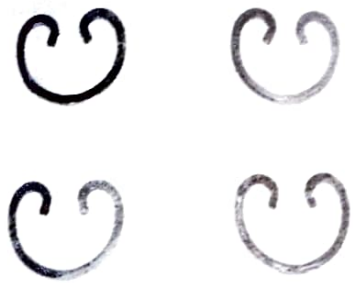


(d) Apply multipurpose grease to the spider and bearings.

(e) Using a vice, press the bearing outer races from both sides on the spider. Press both races until they are level with the shaft surfaces.



(f) Using a socket and vice, adjust both races so that the snap ring grooves are at maximum and equal widths.

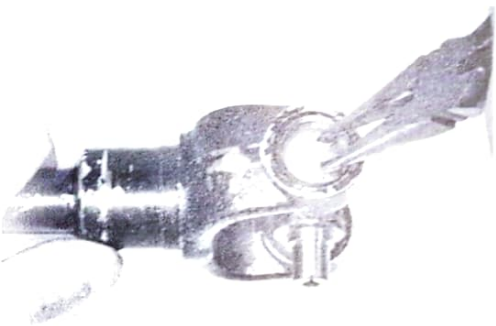


(g) Select two snap rings with the same thickness, which will allow 0 – 0.05 mm (0 – 0.0020 in.) axial play.

NOTE: Do not reuse the snap rings.

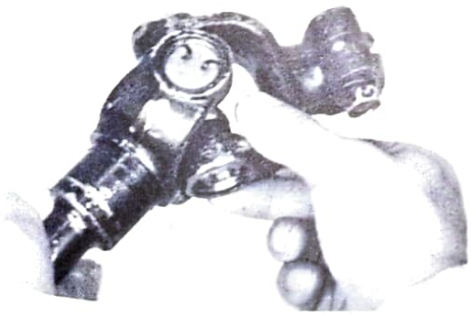
Thickness of snap ring

Mark	Thickness mm (in.)
None	1.175–1.225 (0.0463–0.0482)
Brown	1.225–1.275 (0.0482–0.0502)
Blue	1.275–1.325 (0.0502–0.0522)



(h) Using needle nose pliers, install the snap rings.

NOTE: Install the bearing outer races in the yoke side by the same procedure.



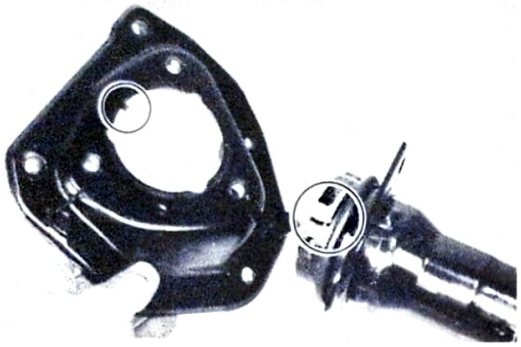
(i) Using a hammer, tap the shaft and yoke until the clearance between the bearing outer race and snap ring is zero.

(j) Check the spider bearing.

- Check that the spider bearing moves smoothly.
- Check the spider bearing axial play.

Bearing axial play: Less than 0.05 mm (0.0020 in.)

ASSEMBLY OF STEERING MAIN SHAFT (See illustration on page 16-13)



1. INSTALL COLUMN HOLE COVER ON COLUMN TUBE

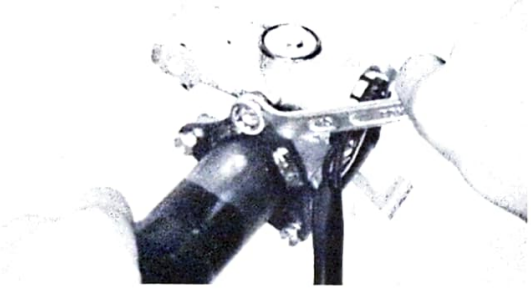
   Install the following parts on the column tube.

   (a) Plate

   (b) O-ring

   (c) Column hole cover

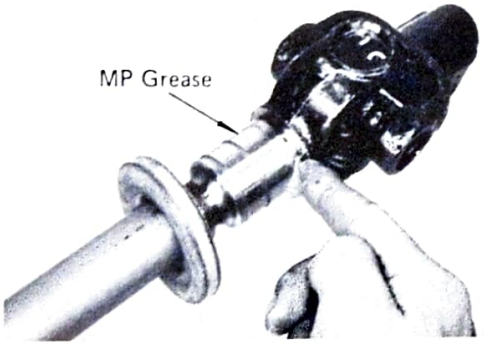
   NOTE: Align the protrusion so that it fits into the column tube groove.



2. INSTALL UPPER BRACKET TO COLUMN TUBE

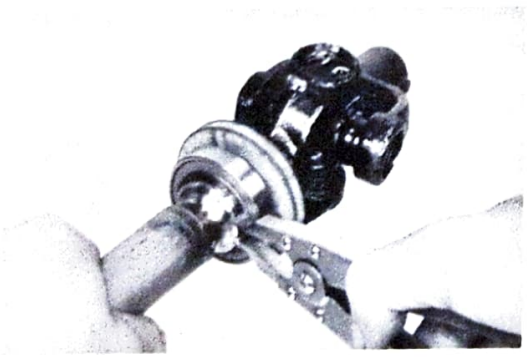
   Install the upper bracket and tighten the bolts.

   Torque: 0.4 – 0.7 kg-m (35 – 60 in.-lb)



3. INSTALL DUST SEAL ON MAIN SHAFT

   Apply multipurpose grease to the main shaft and install the dust seal.

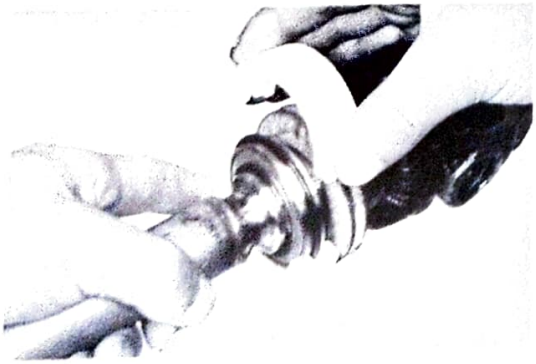


4. INSTALL LOWER BEARING ON MAIN SHAFT

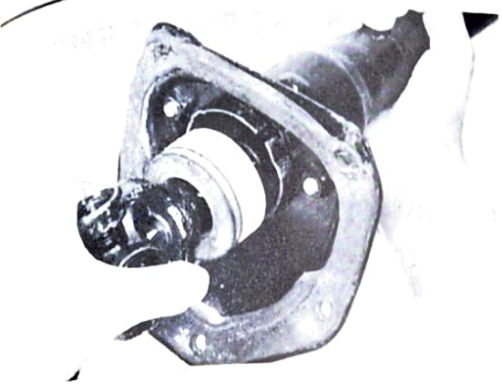
   (a) Using snap ring pliers, install the snap ring.

   (b) Install the lower bearing to the main shaft.

   (c) Install the other snap ring.

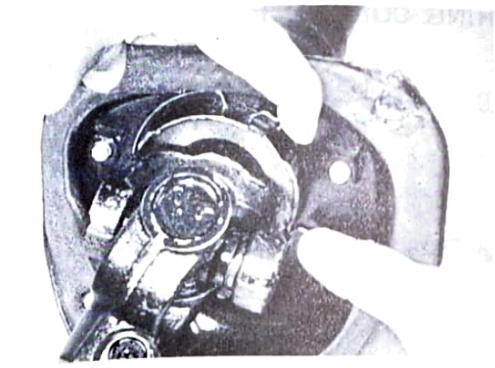


5. INSTALL O-RING AND BEARING SUPPORTS ON LOWER BEARING

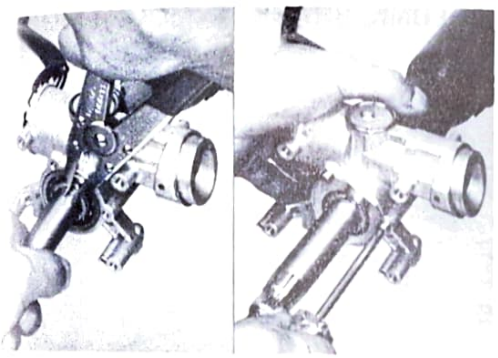


6. INSERT MAIN SHAFT IN COLUMN TUBE

Push the main shaft into the column tube.



7. INSTALL DUST SEAL RETAINER TO COLUMN TUBE



8. INSTALL SNAP RING AND BEARING RETAINER

(a) Using snap ring pliers, install the snap ring.

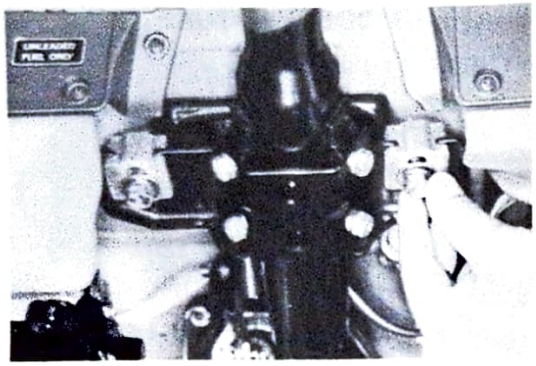
(b) Install the upper bearing retainer.

9. INSTALL COLUMN TUBE BRACKET

Tighten the column tube bracket mounting bolts.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

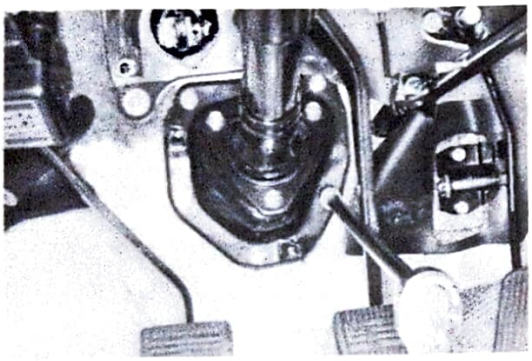
INSTALLATION OF STEERING MAIN SHAFT (See illustration on page 16-13)



1. PLACE COLUMN AND MAIN SHAFT IN INSTALLED POSITION

2. INSTALL COLUMN BRACKET MOUNTING BOLTS BY HAND

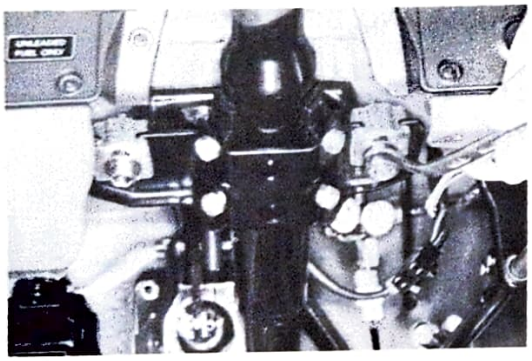
   Install two bracket mounting bolts finger tight only.



3. INSTALL STEERING COLUMN HOLE COVER

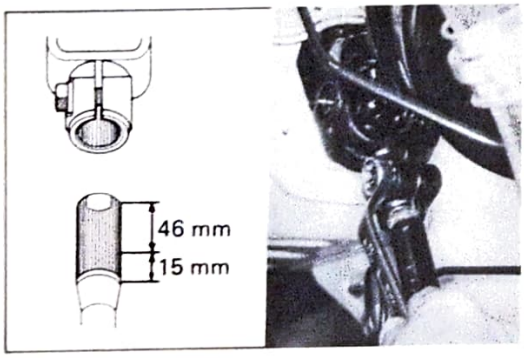
   Tighten the bolts.

   Torque: 0.6 – 0.9 kg-m (53 – 78 in.-lb)



4. TORQUE TWO COLUMN BRACKET MOUNTING BOLTS

   Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)



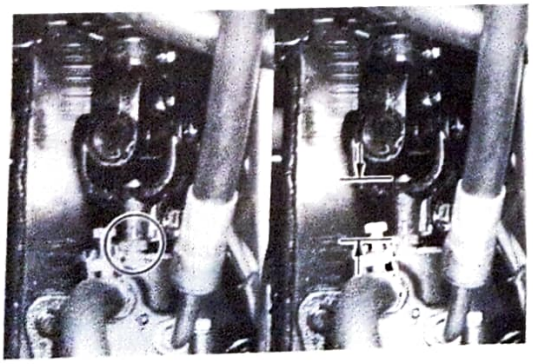
5. INSTALL INTERMEDIATE SHAFT

   (a) Align the non-toothed portions of the intermediate shaft and joint yoke.

   (b) Insert the intermediate shaft into the yoke to a depth of 46 mm (1.81 in.)

   (c) Tighten the joint yoke bolt.

   Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)



   (d) Align the matching marks on the joint yoke and worm shaft.

   (e) Compress and install the intermediate shaft onto the worm shaft.

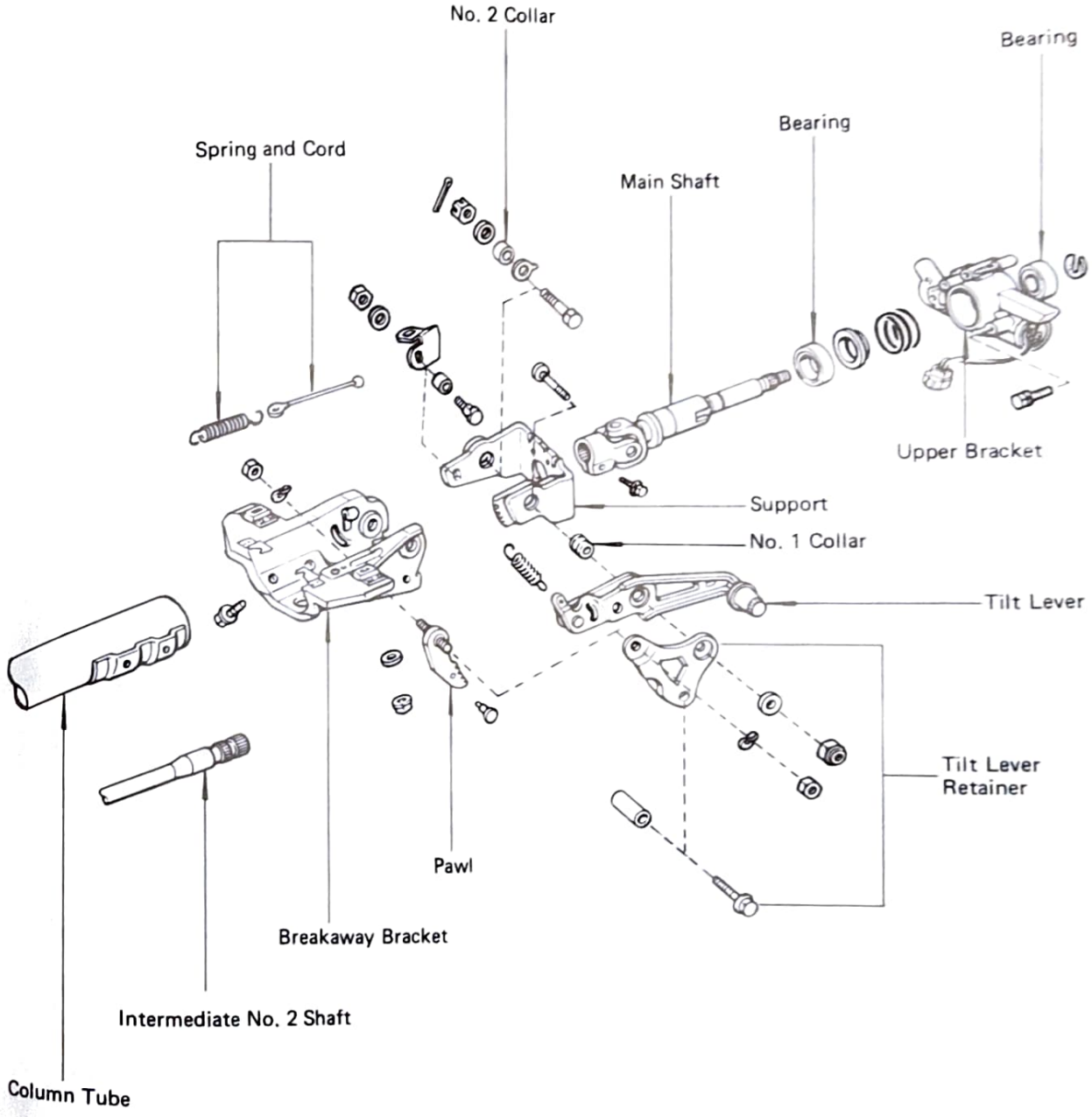
   Depth: Manual steering 27 mm (1.06 in.)
   Power steering 34 mm (1.34 in.)

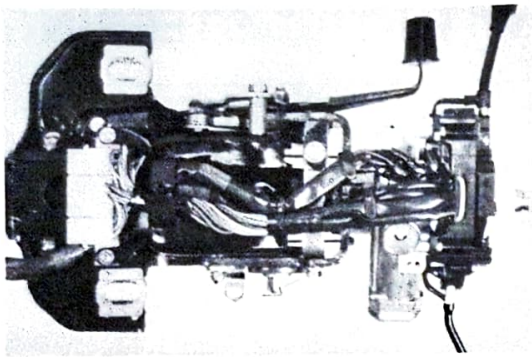
   (f) Tighten the joint yoke bolt.

   Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)

6. INSTALL COMBINATION SWITCH, COLUMN COVER AND STEERING WHEEL (See page 16-12)

STEERING MAIN SHAFT WITH TILT STEERING

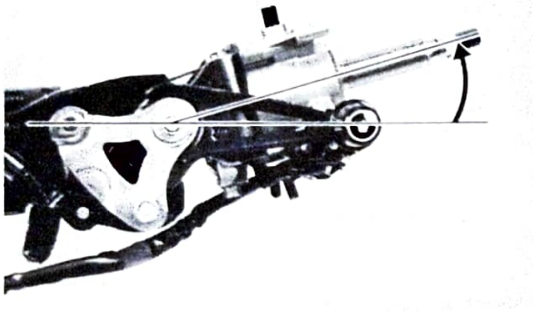




REMOVAL OF STEERING MAIN SHAFT (See page 16-5 or 16-14)

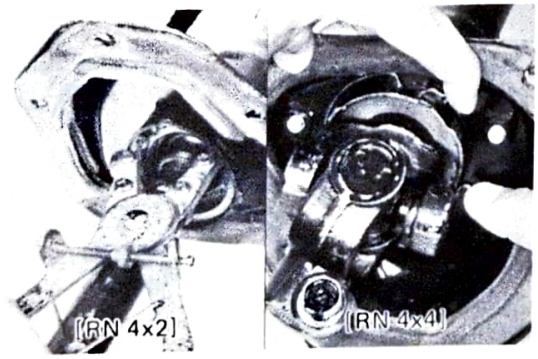
DISASSEMBLY OF STEERING MAIN SHAFT AND TILT MECHANISM

1. REMOVE COMBINATION SWITCH

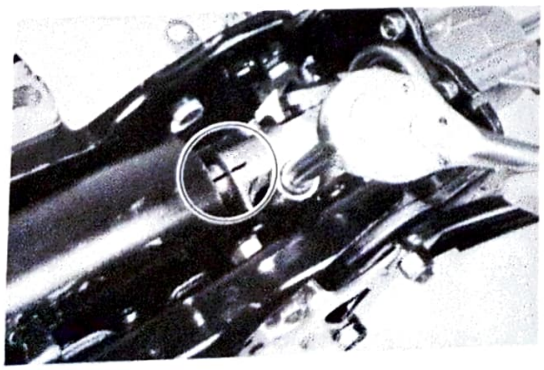


2. REMOVE TENSION SPRINGS AND CORDS
   (a) Tilt the main shaft fully upward.

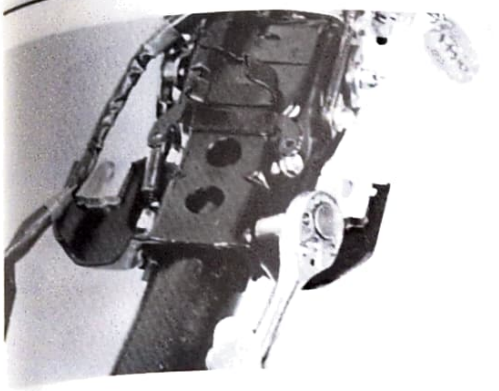
   (b) Pry the spring and remove the cord and spring.



3. REMOVE SNAP RING FROM COLUMN TUBE (RN 4x2)
   REMOVE DUST SEAL RETAINER FROM COLUMN TUBE (RN 4x4)



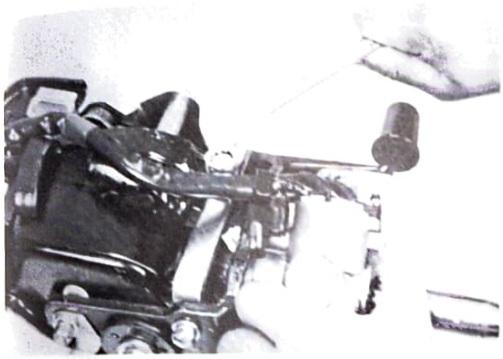
4. DISCONNECT INTERMEDIATE SHAFT AND MAIN SHAFT
   (a) Place an alignment mark on the intermediate shaft and universal joint.
   (b) Remove the joint bolt, and pull out the intermediate shaft from the column tube.



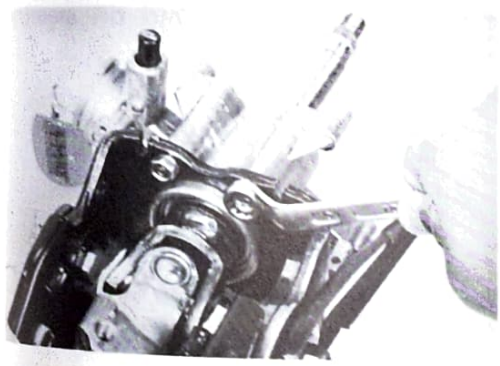
5. REMOVE COLUMN TUBE FROM BREAKAWAY BRACKET

Remove four bracket bolts.

6. REMOVE COLUMN HOLE COVER FROM COLUMN TUBE (See page 16-7)

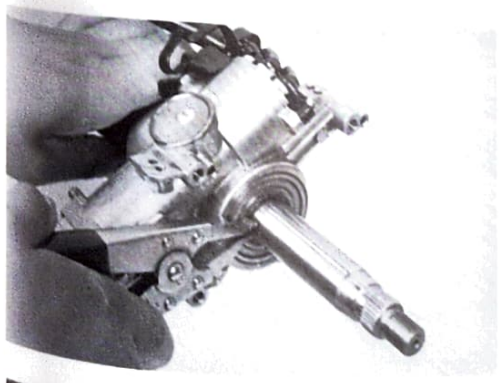


7. REMOVE SUPPORT BRACKET



8. DISCONNECT UPPER BRACKET FROM TILT STEERING SUPPORT

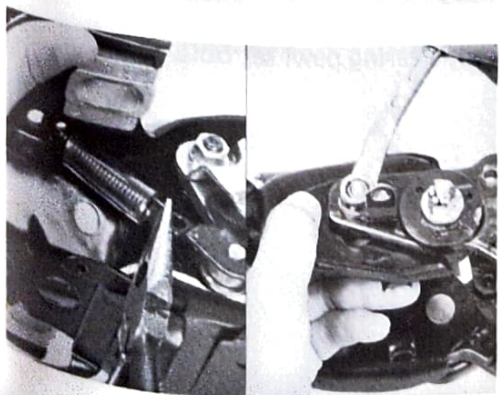
Remove three bolts and disconnect the bracket from support.



9. REMOVE MAIN SHAFT FROM UPPER BRACKET

(a) Using snap ring pliers, remove the snap ring.

(b) Pull out the main shaft from the bracket.

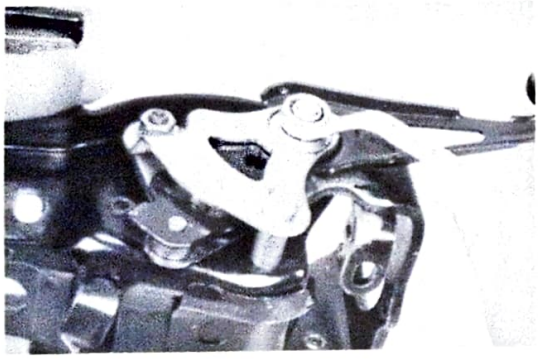


10. DISASSEMBLE TILT STEERING SUPPORT AND BREAKAWAY BRACKET

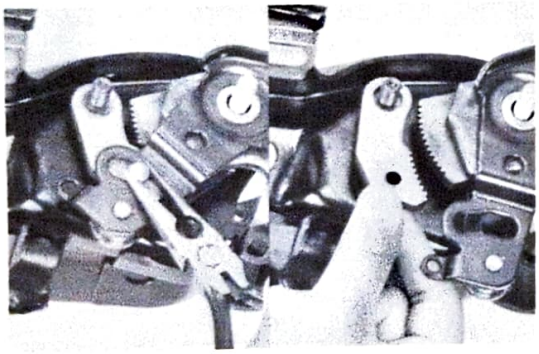
(a) Remove the tension spring from the tilt lever.

(b) Remove the support stopper bolt.

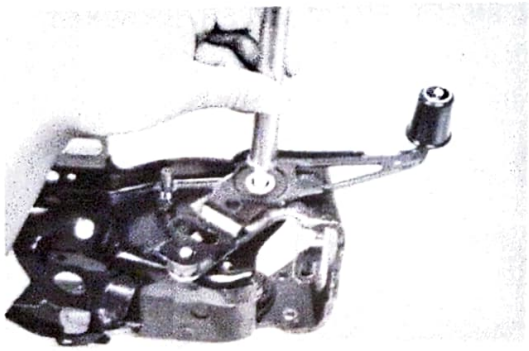
(c) Remove the bolt and support shim.



(d) Remove the tilt lever retainer and collar.

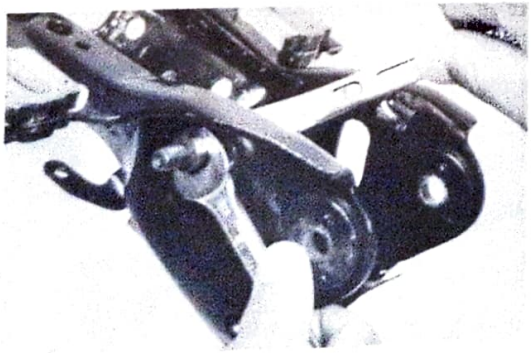


(e) Remove the reclining release pin and tilt steering pawl.

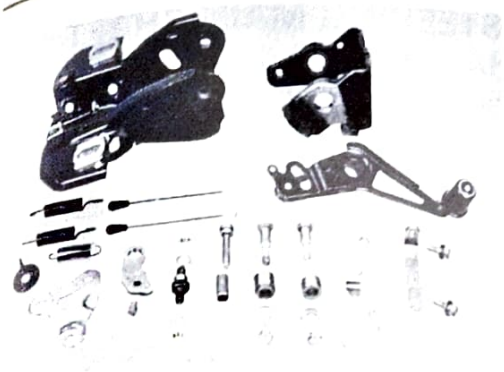


(f) Using a brass bar and hammer, drive out the serration bolt.

(g) Separate the breakaway bracket from the tilt steering support, and remove the tilt lever and collars.

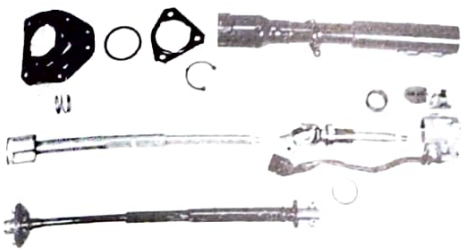


(h) Remove the tilt steering pawl set bolt.

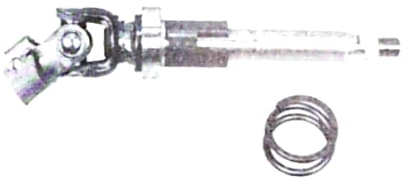


INSPECTION AND REPAIR OF STEERING MAIN SHAFT

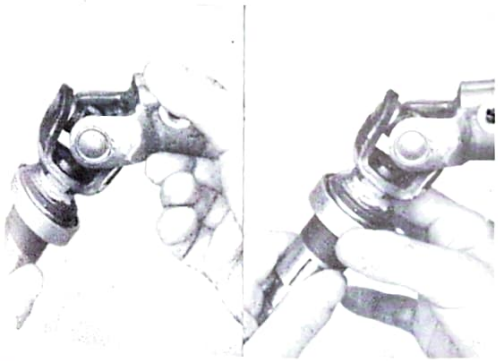
1. INSPECT TILT STEERING PARTS FOR WEAR OR DAMAGE



2. INSPECT UPPER BRACKET, MAIN SHAFT AND INTERMEDIATE SHAFT FOR WEAR OR DAMAGE
(See page 16-7)

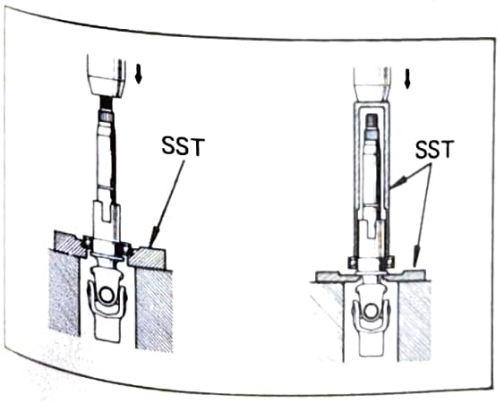


3. INSPECT MAIN SHAFT, THRUST COLLAR AND SPRING
   (a) Inspect the main shaft for bending.
   (b) Inspect the collar for damage.
   (c) Inspect the spring for deformation.



   (d) Inspect the universal joint for play or binding.
   (e) Inspect the lower bearing rotating condition.

   If the bearing does not rotate smoothly, replace it.



4. IF NECESSARY, REPLACE LOWER BEARING
   (a) Using a press and plate*, remove the lower bearing from the main shaft.

   *SST 09527-21011 or Commercial tool

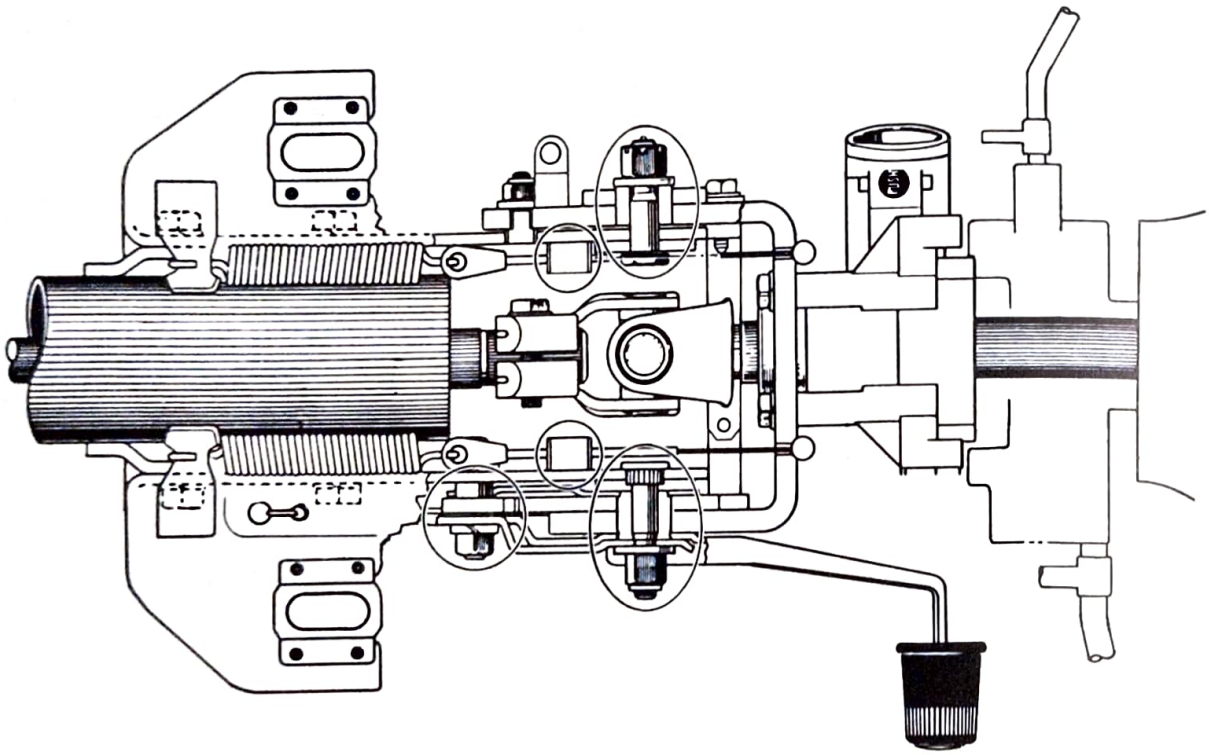
   (b) Pack multipurpose grease into the bearing.
   (c) Using a press, plate and driver*, assemble the lower bearing and main shaft.

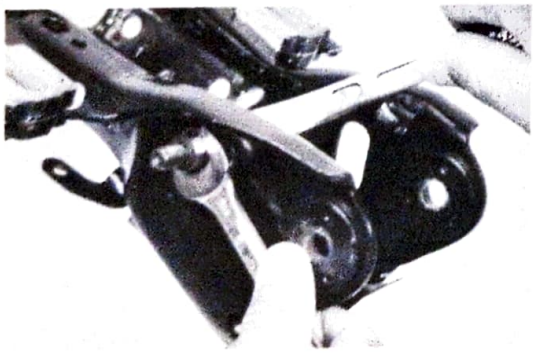
   *SST 09236-28011 and 09612-22010 or Commercial tools

ASSEMBLY OF STEERING MAIN SHAFT AND TILT MECHANISM
(See illustration on page 16-23)

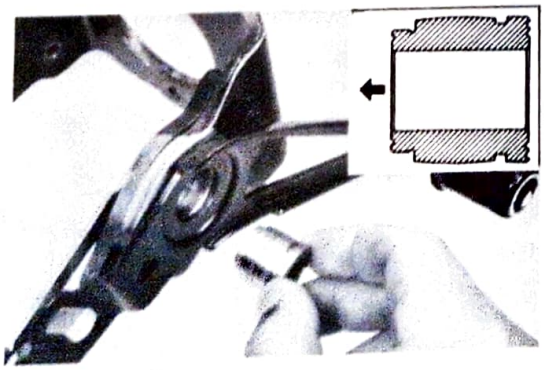
1. COAT ALL RUBBING PARTS WITH MP GREASE

Parts Requiring MP Grease



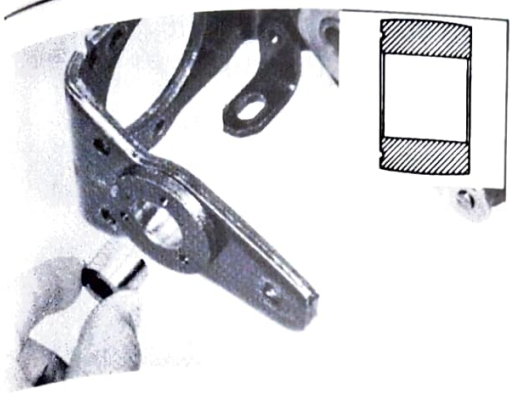


2. ASSEMBLE PAWL SET BOLT
   Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



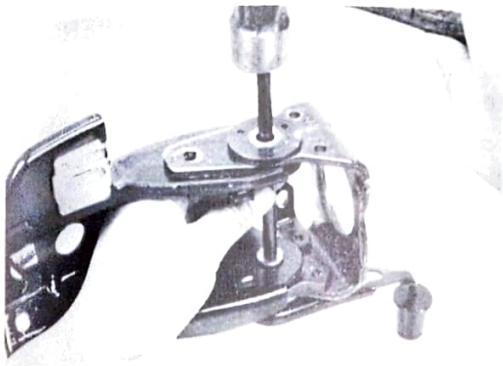
3. ASSEMBLE TILT LEVER TO SUPPORT
   (a) Select a collar No.1 which will eliminate all play between the support and collar, and install it.

Part No.	Outer diameter mm (in.)	
45813-22010	17.996–18.003	(0.7085–0.7088)
45813-22020	18.003–18.010	(0.7088–0.7091)
45813-22030	18.010–18.017	(0.7091–0.7093)
45813-22040	18.017–18.024	(0.7093–0.7096)
45813-22050	17.989–17.996	(0.7082–0.7085)

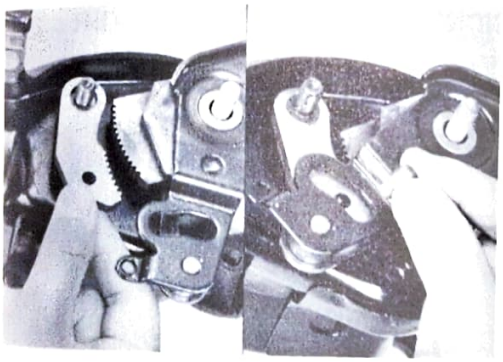


(b) Select a collar No.2 which will eliminate all play between the support and collar, and install it.

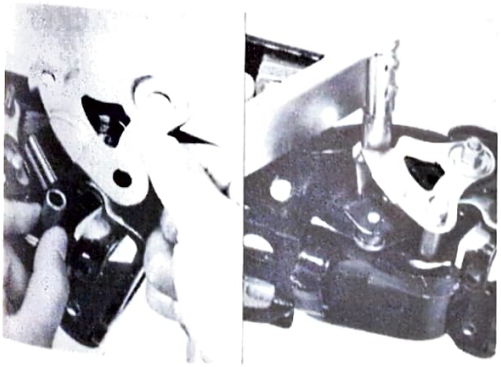
Part No.	Outer diameter	mm (in.)
45814-22010	17.982–18.000	(0.7080–0.7087)
45814-22020	18.000–18.018	(0.7087–0.7094)



(c) Drive in the serration bolt to the support.

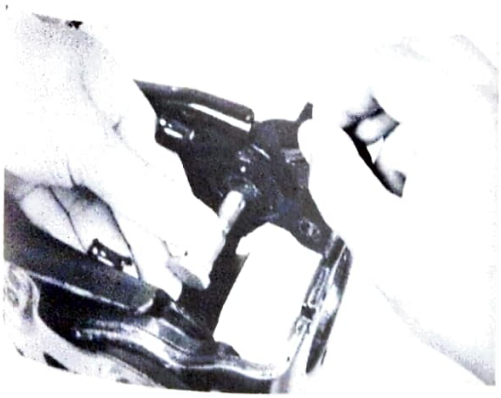


(d) Install the tilt steering pawl and the reclining release pin.



(e) Assemble the collar and tilt lever retainer.

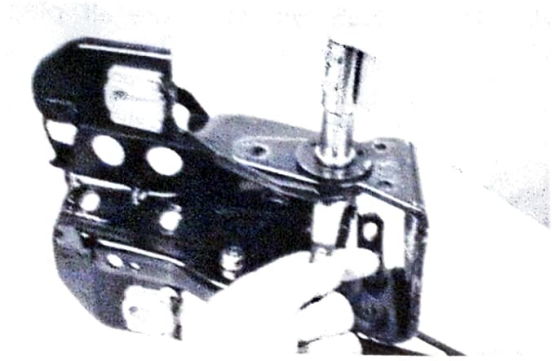
Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



4. INSTALL SHIM, BOLT AND NUT

(a) Select a shim which fits snugly when pressed in by hand.

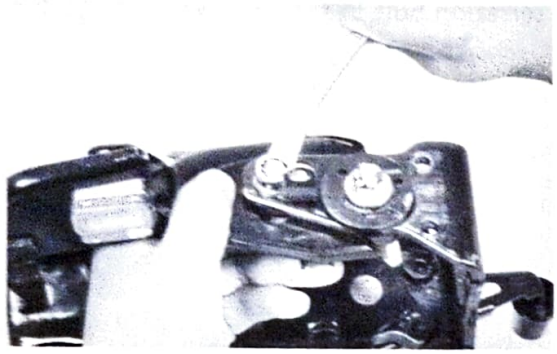
Part No.	Thickness	mm (in.)
45815-22010	0.2	(0.008)
45815-22020	0.5	(0.020)
45815-22030	0.8	(0.031)
45815-22040	1.4	(0.055)
45815-22050	1.8	(0.071)



(b) Install the shim, bolt, washer and a nut.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

(c) Install a cotter pin.

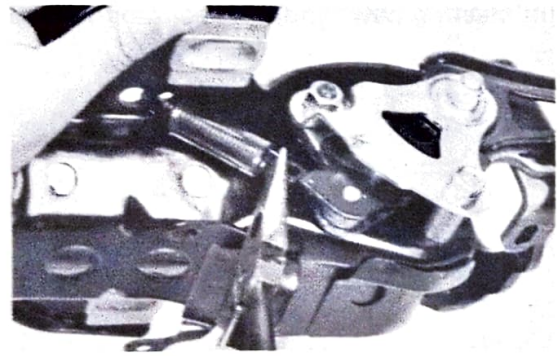


5. **INSTALL TILT STEERING SUPPORT STOPPER BOLT**

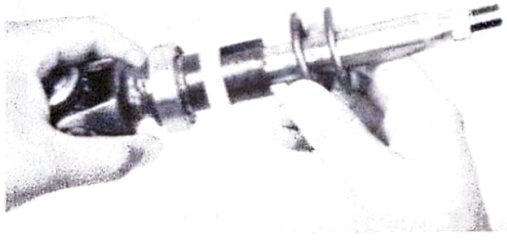
(a) Install the stopper bolt and bracket.

(b) Tighten the nut so the bracket is parallel with the tilt steering support.

Torque: 0.8 – 1.2 kg-m (70 – 104 in.-lb)

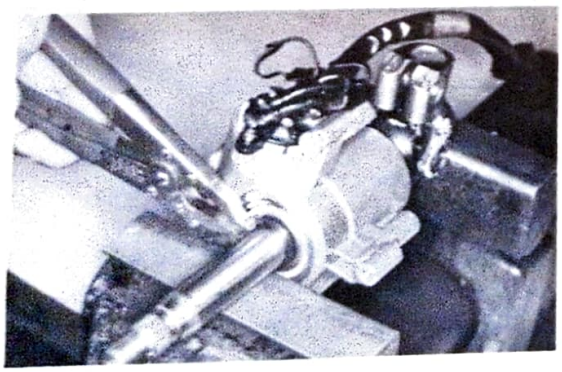


6. **INSTALL TENSION SPRING TO TILT LEVER**



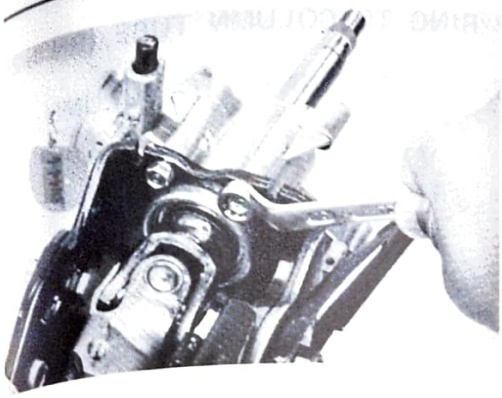
7. **ASSEMBLE MAIN SHAFT AND UPPER BRACKET**

(a) Assemble the collar, spring and main shaft, and insert them into the bracket.



(b) Using a soft jaw vise, press the main shaft and upper bearing.

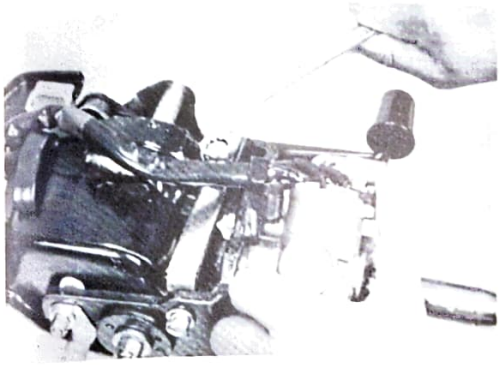
(c) Using snap ring pliers, install a new snap ring.



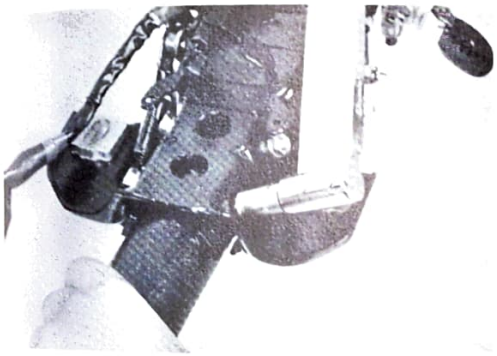
8. ASSEMBLE UPPER BRACKET AND SUPPORT

Place the upper bracket in position and tighten three bolts.

Torque: 0.6 – 0.9 kg-m (53 – 78 in.-lb)



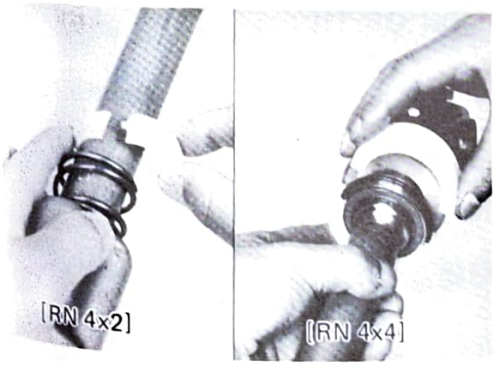
9. INSTALL SUPPORT BRACKET



10. INSTALL COLUMN HOLE COVER TO COLUMN TUBE

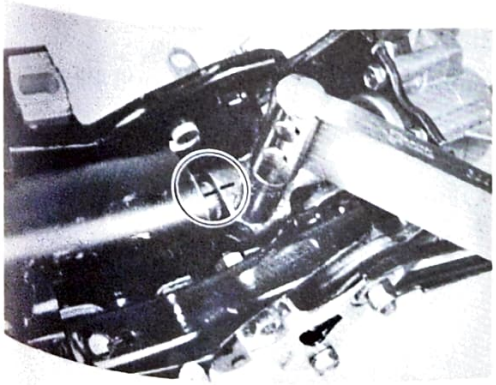
11. ASSEMBLE BREAKAWAY BRACKET TO COLUMN TUBE

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)



12. INSTALL SPRING AND SPRING RETAINER TO MAIN SHAFT (RN 4x2)

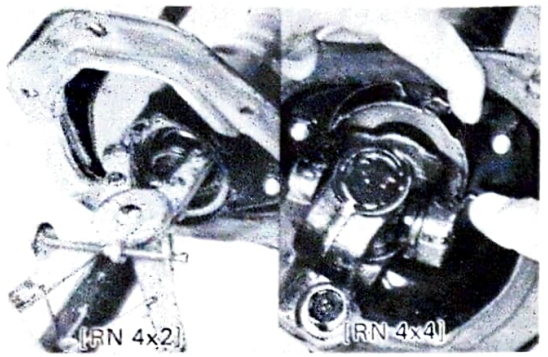
INSTALL O-RING AND BEARING SUPPORTS ON LOWER BEARING (RN 4x4)



13. CONNECT MAIN SHAFT AND INTERMEDIATE SHAFT

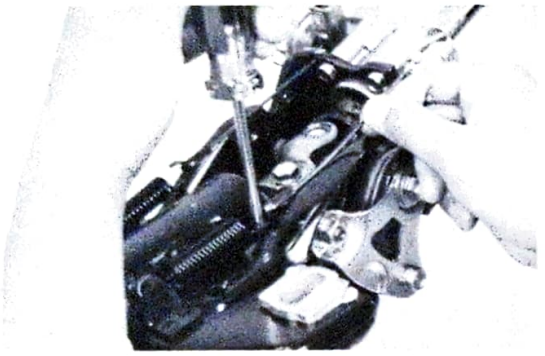
Align the matchmarks on the joint and intermediate shaft and tighten the bolt.

Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)



14. INSTALL SNAP RING TO COLUMN TUBE (RN 4x2)

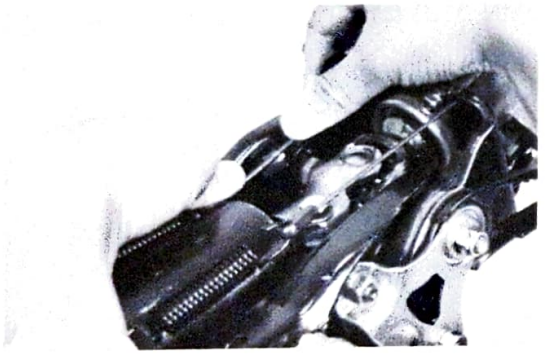
INSTALL DUST SEAL RETAINER TO COLUMN TUBE (RN 4x4)



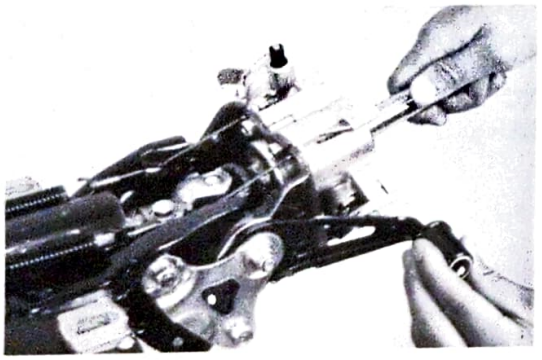
15. INSTALL TWO SPRINGS AND TWO CORDS

(a) Connect the spring and cord, and hook the spring to the hanger.

(b) Pry the spring end and hook the cord end to the support.



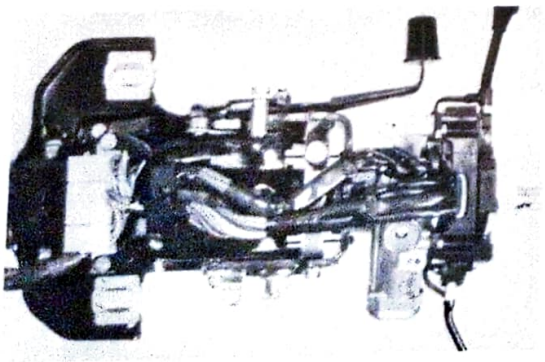
(c) Hook the cords to the cord guides.



16. CHECK OPERATION OF TILT STEERING LEVER AND SUPPORT

(a) Check that there is no axial or horizontal play at the end of the main shaft.

(b) Check that the main shaft locks securely in all six positions.



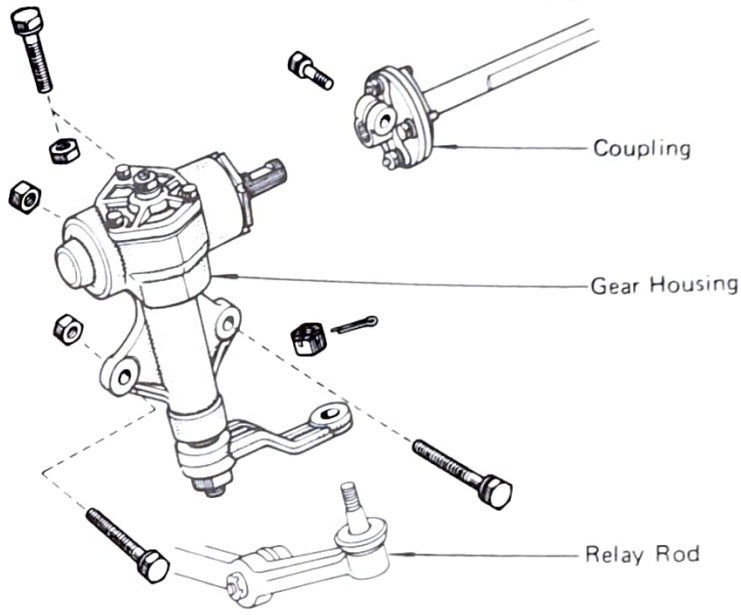
17. INSTALL COMBINATION SWITCH

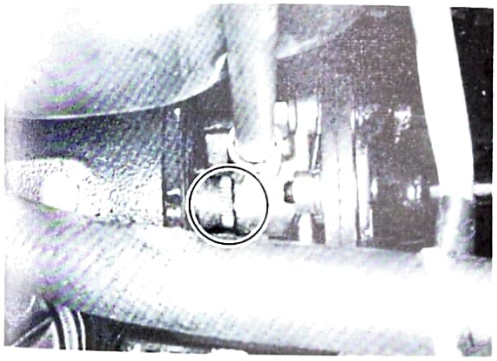
(a) Install the combination switch and wiring connector.

(b) Clamp the wire.

INSTALLATION OF STEERING MAIN SHAFT (See page 16-11 or 16-22)

STEERING GEAR HOUSING (RN 4x2)



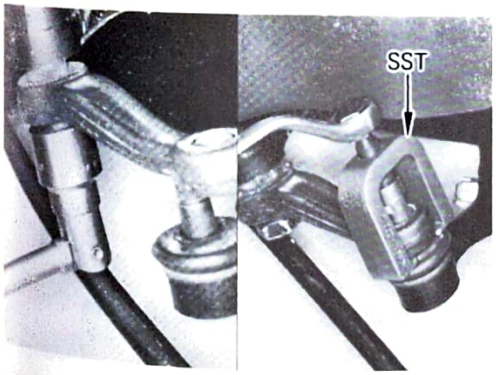


REMOVAL OF STEERING GEAR HOUSING

1. MARK COUPLING AND WORM SHAFT

   Place an alignment mark on the coupling and worm shaft to ensure correct reassembly.

2. REMOVE COUPLING BOLT

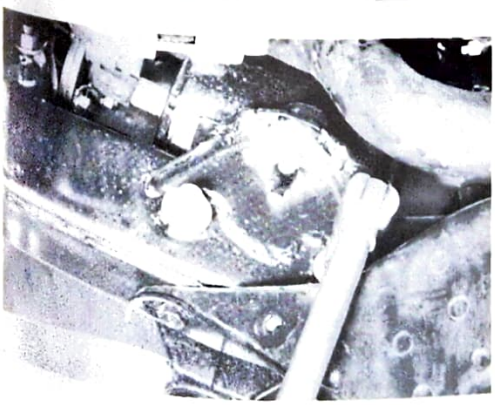


3. DISCONNECT RELAY ROD FROM PITMAN ARM

   (a) Loosen the pitman arm set nut.

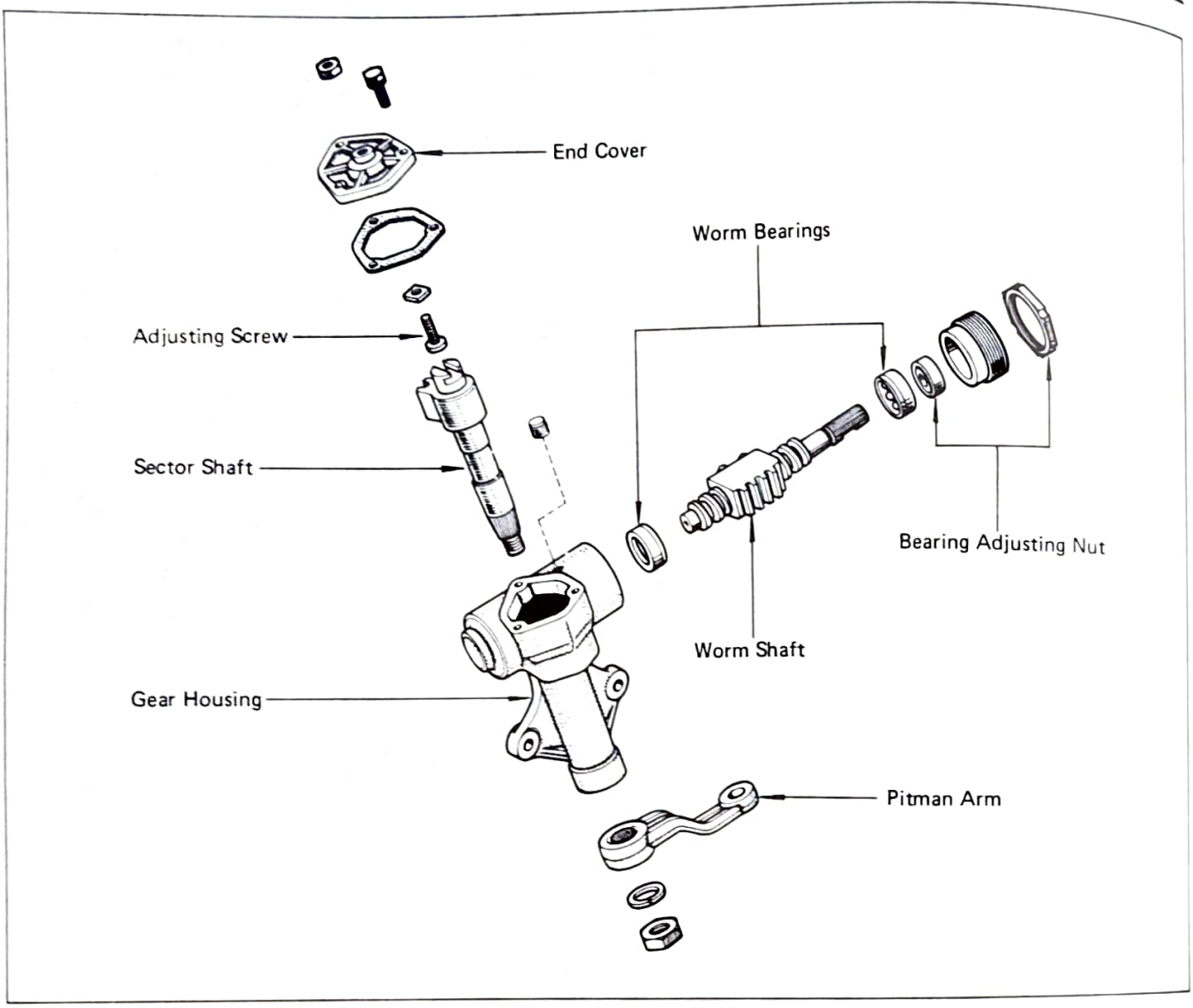
   (b) Using a tie rod end puller*, disconnect the relay rod from the pitman arm.

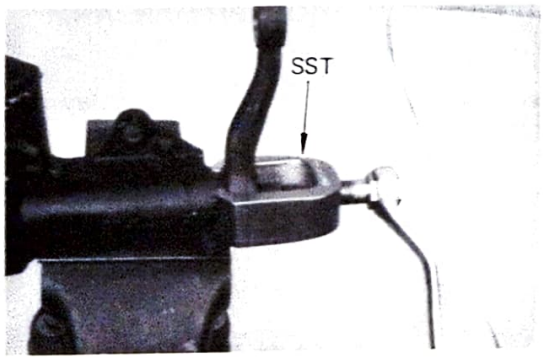
   *SST 09611-20014

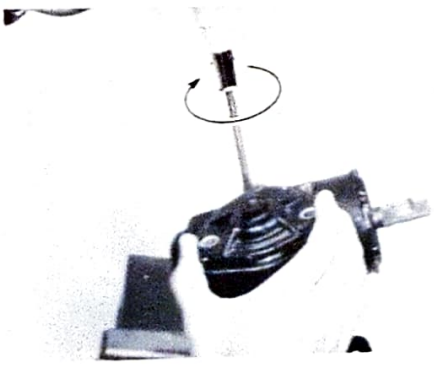


4. REMOVE GEAR HOUSING

   Remove three bolts and pull gear housing from coupling.







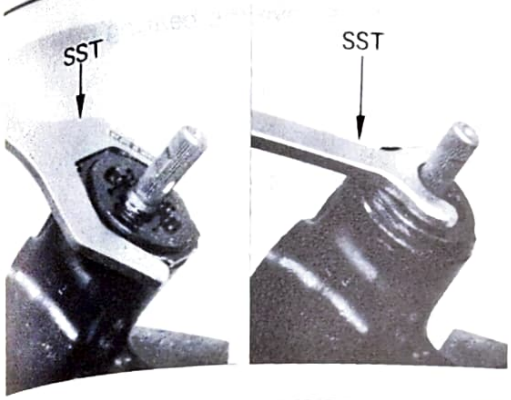
DISASSEMBLY OF STEERING GEAR HOUSING

1. REMOVE OIL FILLER PLUG AND DRAIN GEAR HOUSING OIL

2. REMOVE PITMAN ARM
   (a) Remove the pitman arm set nut.
   (b) Using a pitman arm puller*, pull the pitman arm off the sector shaft.

   *SST 09610-55012

3. REMOVE END COVER AND SECTOR SHAFT
   (a) Remove the adjusting screw lock nut and three bolts.
   (b) Remove the end cover by tightening the adjusting screw.
   (c) Pull the sector shaft from the housing.



4. REMOVE LOCK NUT

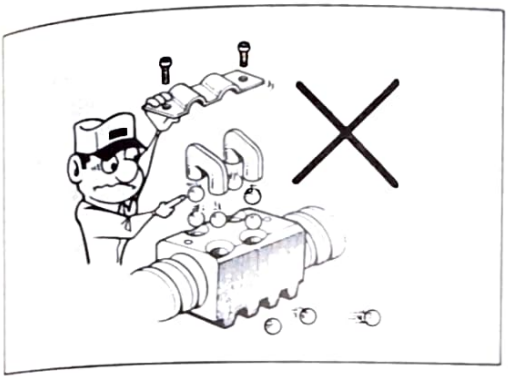
Using a lock nut wrench*, remove the lock nut.

*SST 09617-30040 or Commercial wrench

5. REMOVE BEARING ADJUSTING SCREW

Using a bearing adjusting screw wrench*, remove the adjusting screw.

*SST 09616-22010 or Commercial wrench

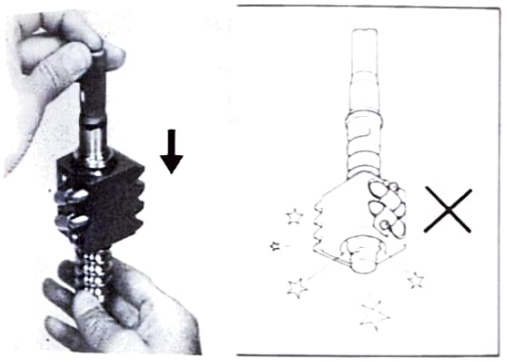


6. REMOVE WORM SHAFT

Pull the worm shaft out of the gear housing.

CAUTION: Do not disassemble the ball nut from the steering worm shaft.

INSPECTION AND REPAIR OF STEERING GEAR HOUSING



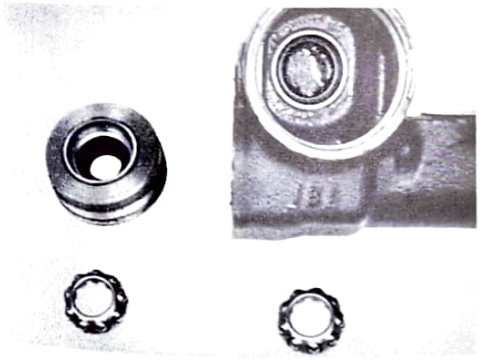
1. INSPECT WORM AND BALL NUT

(a) Check worm and ball nut for wear or damage.

(b) Check that the nut rotates smoothly down the shaft by its own weight.

CAUTION: Do not allow the ball nut to hit the end of the worm shaft.

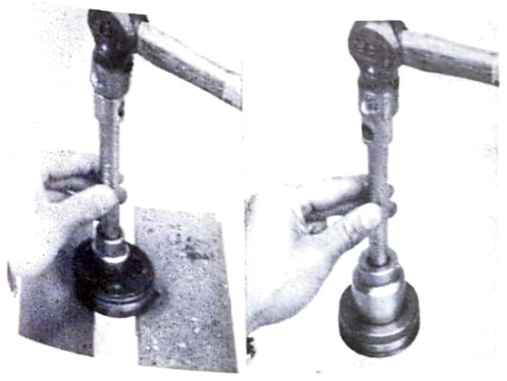
If a problem is found, repair or replace the worm.



2. INSPECT WORM BEARINGS AND RACES

Check for wear or damage.

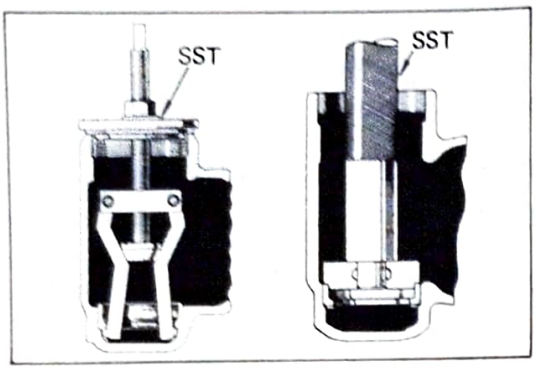
If a problem is found, replace the bearings, bearing races and oil seal.



3. IF NECESSARY REPLACE BEARING RACES AND OIL SEAL

(a) Using a punch and hammer, remove the bearing race and oil seal from the adjusting nut.

(b) Using a driver and hammer, carefully install a new bearing race and oil seal.

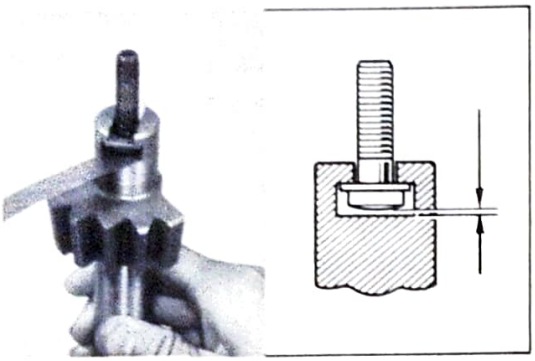


(c) Using a bearing puller*, remove the bearing race from the gear housing.

*SST 09612-30013 or Commercial puller

(d) Using a driver* and hammer, install the bearing race.

*SST 09620-30010 or Commercial driver



4. INSPECT SECTOR SHAFT

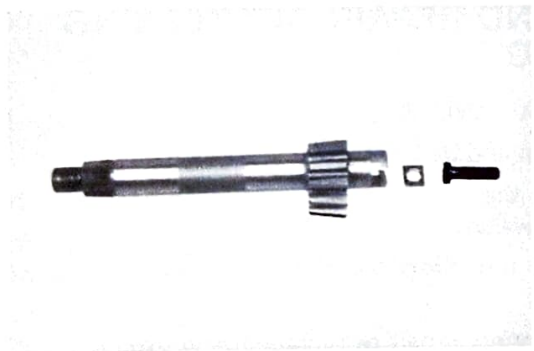
(a) Measure shaft thrust clearance with a feeler gauge.

Maximum clearance: 0.05 mm (0.0020 in.)

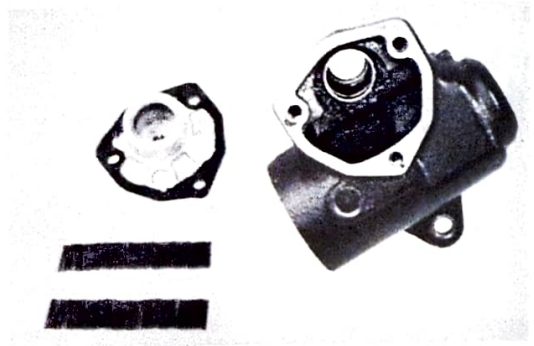
If necessary, install a new thrust washer to provide the minimum clearance between the sector shaft and the adjusting screw.

Thrust washer thickness

Part No.	Thickness	mm (in.)
45353-20010	1.95	(0.0768)
45352-20010	2.00	(0.0787)
45354-20010	2.05	(0.0807)
45355-20010	2.10	(0.0827)
45356-20010	2.15	(0.0846)



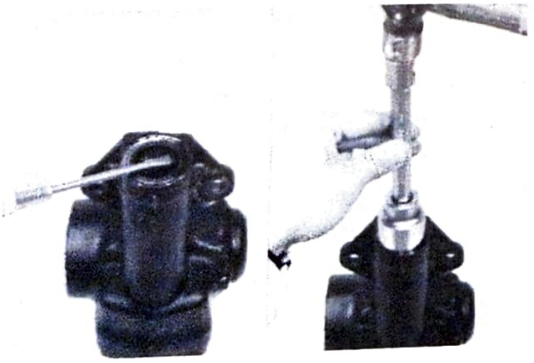
(b) Check the shaft, thrust washer, and adjusting screw for wear or damage.



5. INSPECT END COVER BUSHING, NEEDLE ROLLER BEARINGS AND GEAR HOUSING OIL SEAL

Check parts for wear or damage.

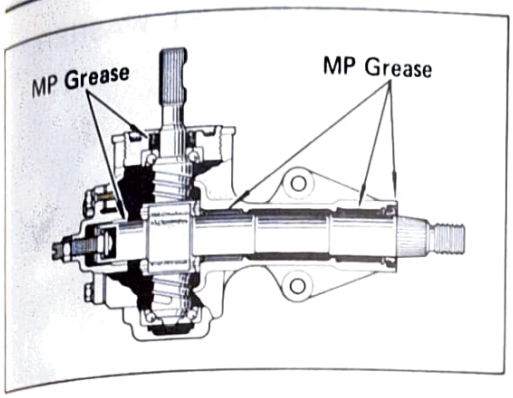
If the oil seal is worn or damaged, replace it.



6. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver, remove the oil seal from the gear housing.

(b) Using a driver and hammer, install the new oil seal.

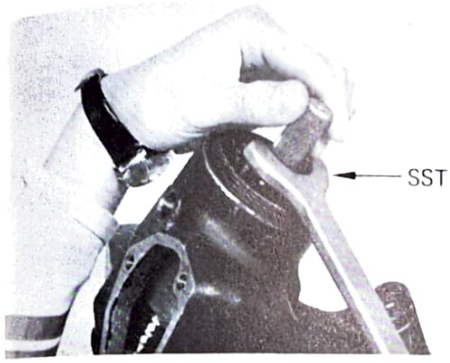


ASSEMBLY OF STEERING GEAR HOUSING (See illustration on page 16-34)

1. APPLY MULTIPURPOSE GREASE TO BUSHING, NEEDLE ROLLER BEARINGS AND OIL SEALS

2. INSERT WORM SHAFT INTO GEAR HOUSING

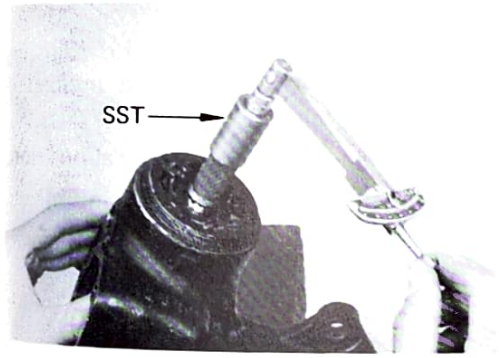
Place worm bearings on the shaft and insert the shaft into the housing.



3. INSTALL AND ADJUST BEARING ADJUSTING SCREW

(a) Using an adjusting screw wrench*, gradually tighten the adjusting screw until snug.

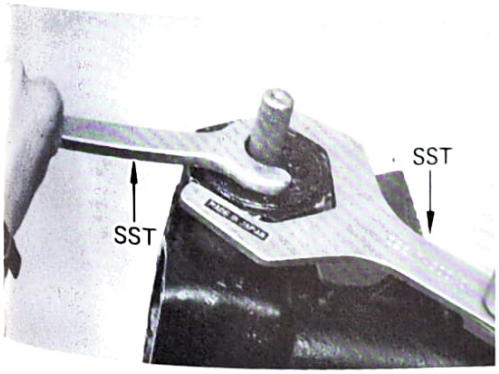
*SST 09616-22010 or Commercial wrench



(b) Using a torque wrench and socket*, measure the bearing preload in BOTH directions. Turn the adjusting screw until the preload is correct.

Preload (starting): 3.0 – 5.0 kg-cm (2.6 – 4.3 in.-lb)

*SST 09616-00010 or 00002-00800

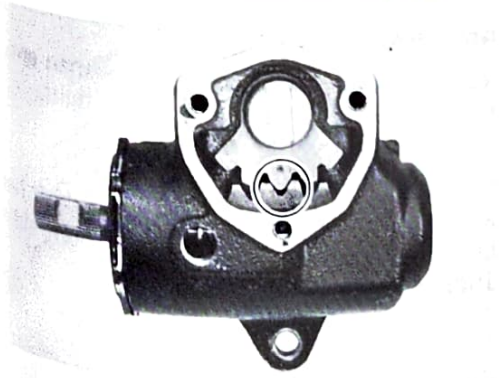


(c) Hold the adjusting screw in position with an adjusting screw wrench* and tighten the lock nut with a lock nut wrench*.

Torque: 23.0 – 26.0 kg-m (167 – 188 ft-lb)

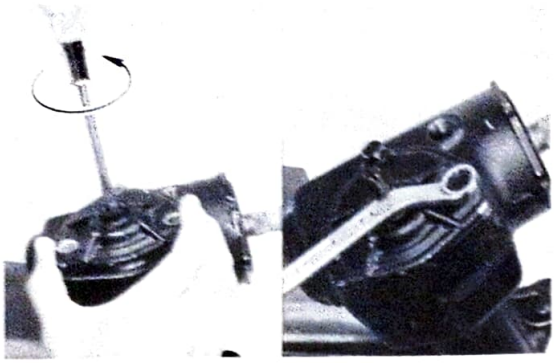
*SST 09616-22010 and 09617-30040
or Commercial wrenches

NOTE: Check that the bearing preload is still correct.



4. INSTALL SECTOR SHAFT

Set the ball nut at the center of the worm shaft. Insert the sector shaft into the gear housing so that the center teech mesh together.



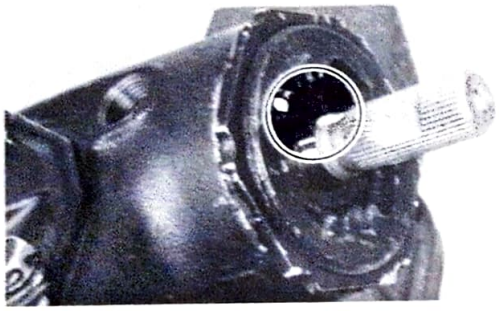
5. **INSTALL ADJUSTING SCREW, THRUST WASHER AND END COVER**

(a) Install three end cover bolts, finger tight.

(b) Loosen the adjusting screw as far as possible.

(c) Torque three cover bolts.

Torque: 1.5 – 2.2 kg-m (11 – 15 ft-lb)

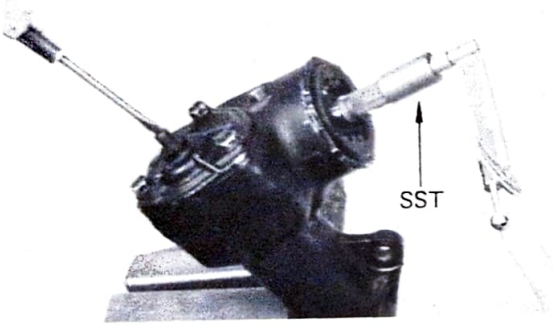


6. **PLACE WORM SHAFT IN NEUTRAL POSITION**

Count the total shaft rotations and turn the shaft back half of that number. The worm shaft is now in neutral position.

7. **MARK WORM SHAFT AND HOUSING**

Place an alignment mark on the worm shaft and housing to show neutral position.



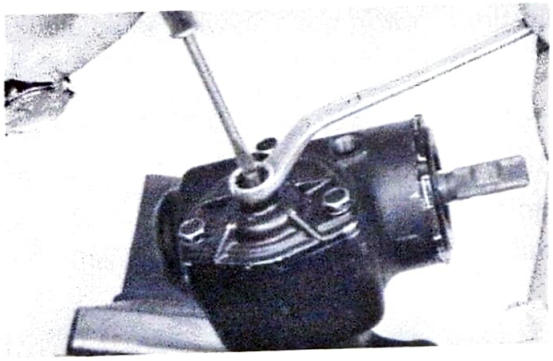
8. **ADJUST OVERALL PRELOAD**

Using a torque wrench and socket*, turn the adjusting screw while measuring the preload until the preload is correct.

NOTE: Be sure that the worm shaft is in neutral position.

Preload (starting): 8.0 – 10.5 kg-cm (6.9 – 9.1 in.-lb)

*SST 09616-00010 or 00002-00800

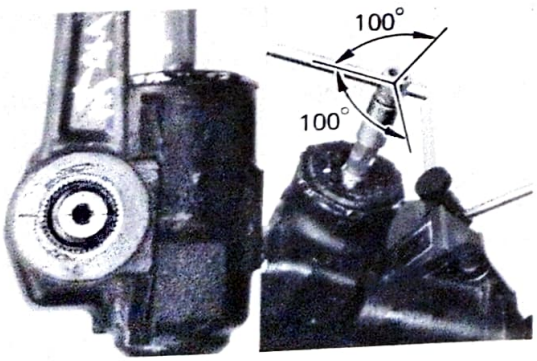


9. **TIGHTEN ADJUSTING SCREW LOCK NUT**

Hold the screw with a screwdriver while tightening the lock nut. Torque the lock nut.

Torque: 1.9 – 3.1 kg-m (14 – 22 ft-lb)

NOTE: Check that the preload is still correct.

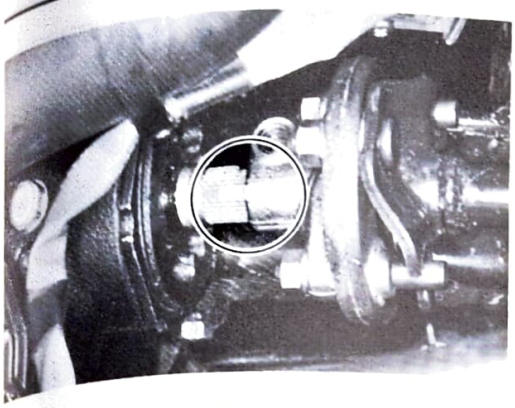


10. **INSTALL PITMAN ARM**

Align the marks on the sector shaft with the pitman arm. Install the pitman arm and tighten the nut finger tight.

11. **MEASURE SECTOR SHAFT BACKLASH**

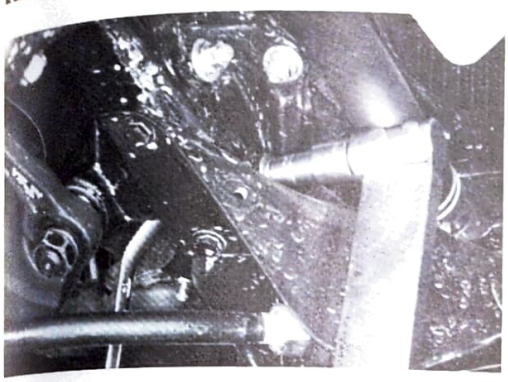
Install the backlash gauge. Check that the sector shaft has no backlash within 100 degrees of the left and right sides from neutral position.



INSTALLATION OF STEERING GEAR HOUSING
(See illustration on page 16-33)

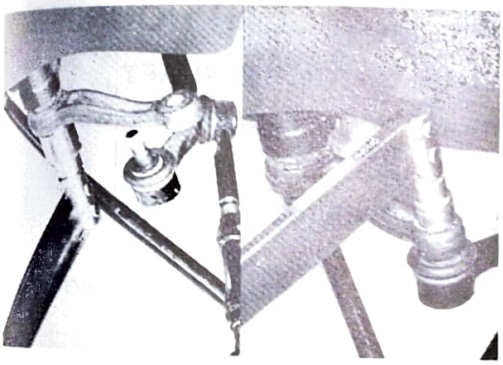
1. INSTALL GEAR HOUSING

(a) Align the marks on the worm shaft with the coupling.



(b) Install the housing with three bolts. Torque the bolts.

Torque: 5.0 – 6.0 kg-m (37 – 43 ft-lb)



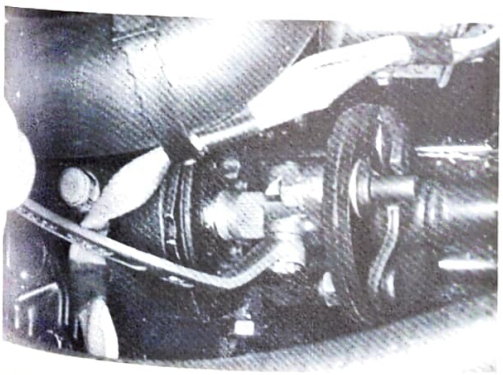
2. TORQUE PITMAN ARM SET NUT

Torque: 11.0 – 12.5 kg-m (80 – 90 ft-lb)

3. CONNECT PITMAN ARM TO STEERING LINKAGE

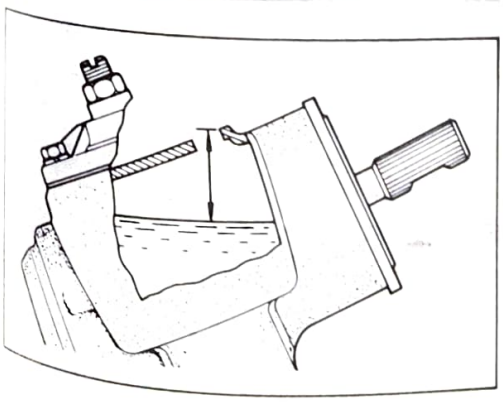
Connect the arm to the linkage and torque the nut.
Install a new cotter pin.

Turque: 7.5 – 11.0 kg-m (55 – 79 ft-lb)



4. INSTALL AND TORQUE COUPLING SET BOLT

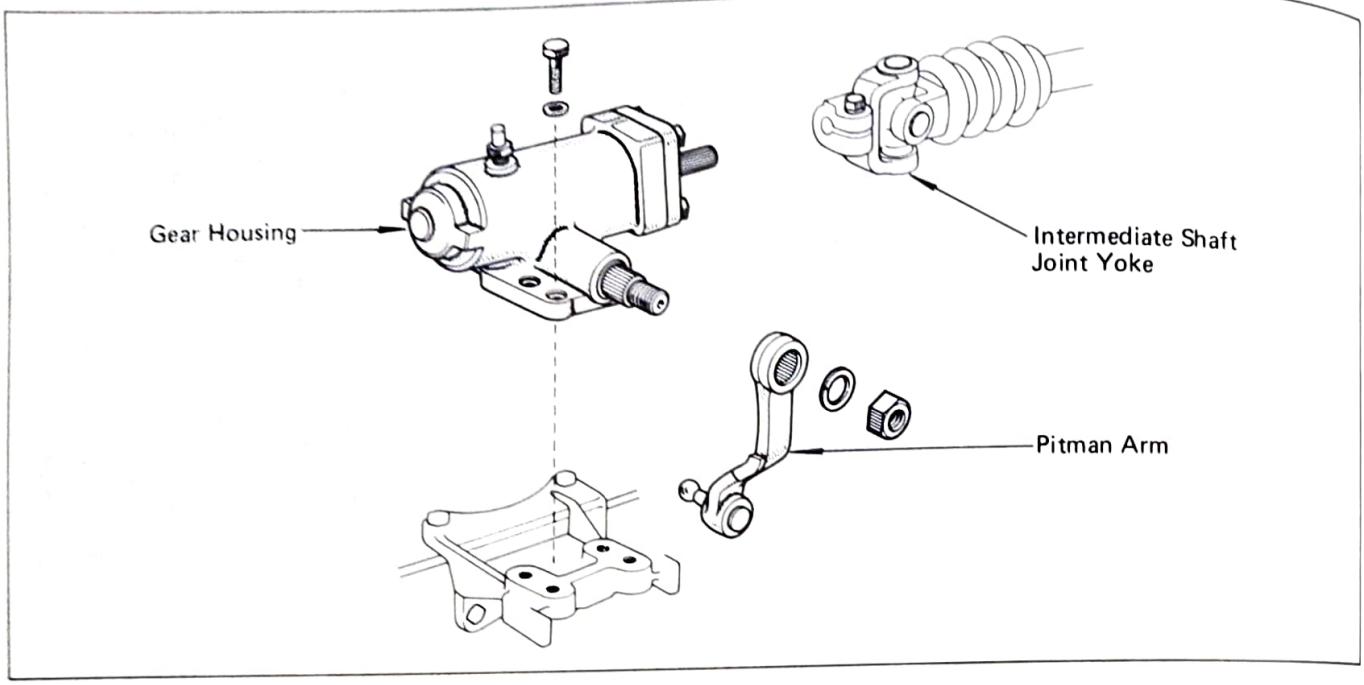
Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)

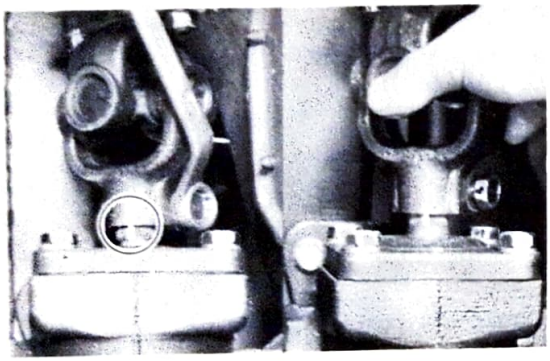


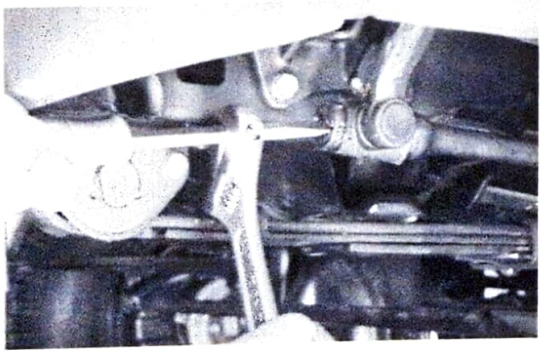
5. FILL GEAR HOUSING WITH GEAR OIL

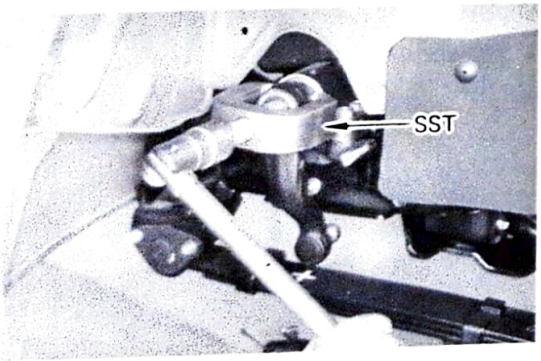
Oil level: 18 – 28 mm (0.71 – 1.10 in.) from top
Capacity: 380 – 400 cc (23.2 – 24.4 cu in.)

STEERING GEAR HOUSING (RN 4x4)









REMOVAL OF STEERING GEAR HOUSING

1. **MARK JOINT YOKE AND WORM SHAFT**

   Place an alignment mark on the joint yoke and worm shaft to ensure correctly reassembly.

2. **DISCONNECT INTERMEDIATE SHAFT FROM WORM SHAFT**

   Loosen the joint yoke bolt and compress the intermediate shaft.

3. **DISCONNECT DRAG LINK FROM PITMAN ARM**

   (a) Remove the cotter pin and plug from the drag link.

   (b) Disconnect the drag link from the pitman arm.

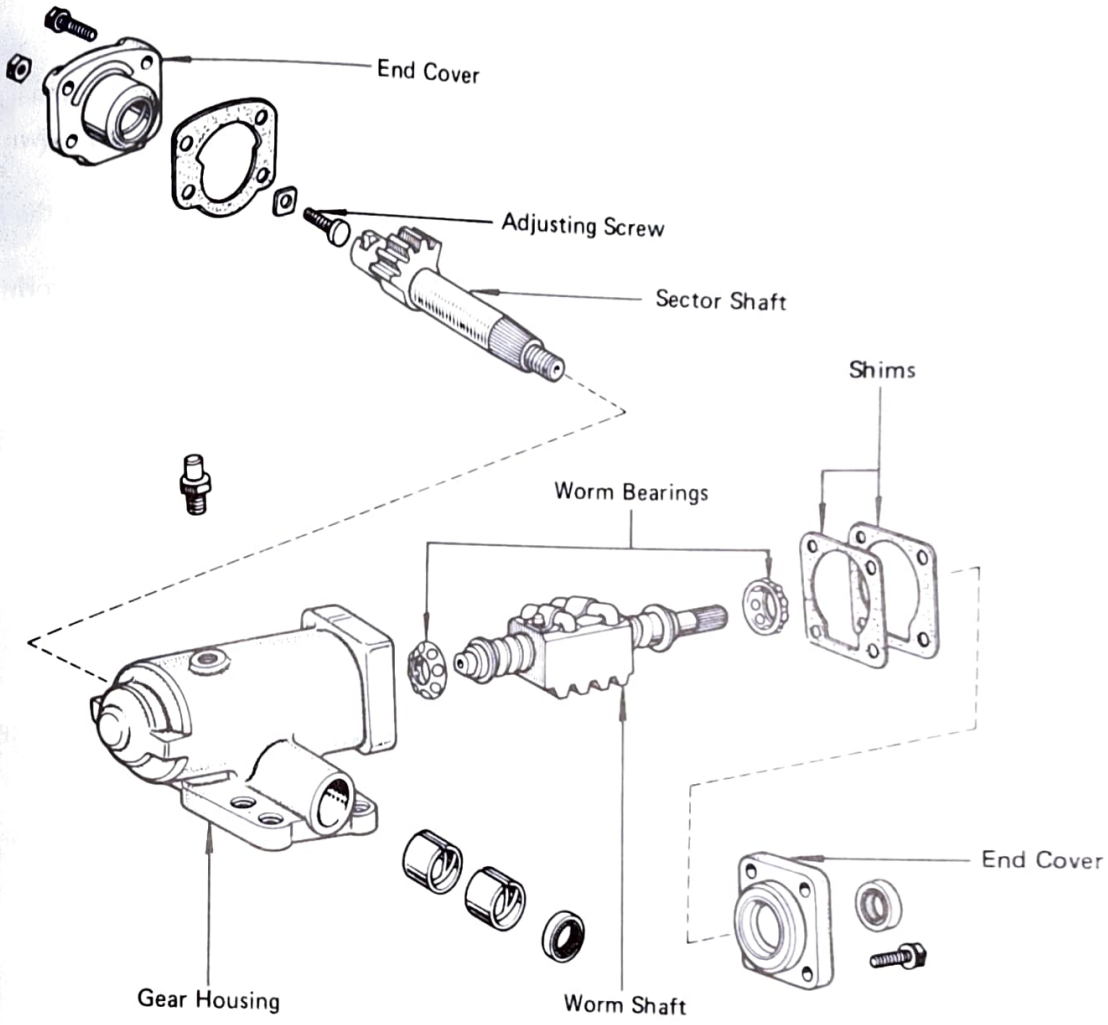
4. **REMOVE PITMAN ARM FROM GEAR HOUSING**

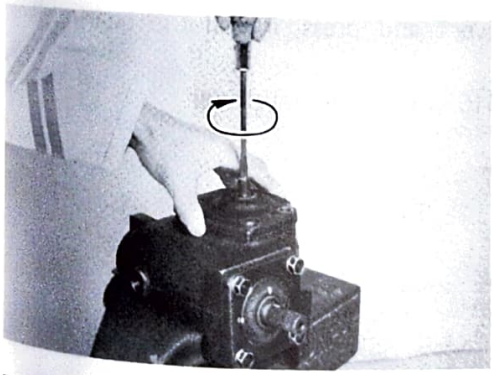
   Remove the pitman arm set nut. Using a pitman arm puller*, disconnect the pitman arm from the gear housing.

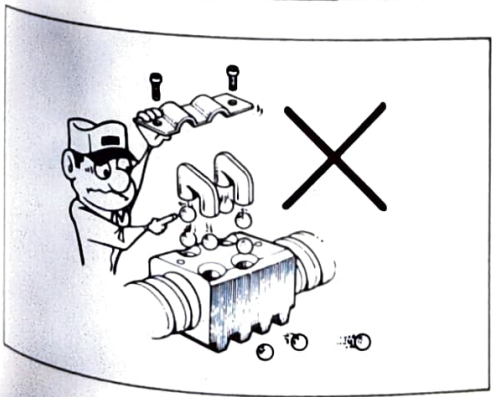
   *SST 09610-55012

5. **REMOVE GEAR HOUSING**

   Remove four bolts and take the gear housing out of the engine compartment side.







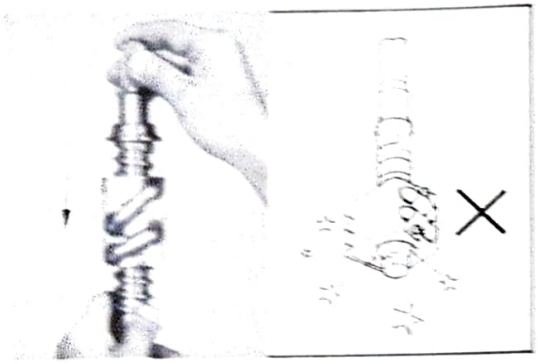
DISASSEMBLY OF STEERING GEAR HOUSING

1. REMOVE OIL FILLER PLUG AND DRAIN GEAR HOUSING OIL

2. REMOVE END COVER AND SECTOR SHAFT
   (a) Remove the adjusting screw lock nut and four bolts.
   (b) Remove the end cover by tightening the adjusting screw.
   (c) Pull the sector shaft from the housing.

3. REMOVE END COVER AND WORM SHAFT
   (a) Remove the end cover and shims.
   (b) Remove the worm shaft and the two bearings.

CAUTION: Do not disassemble the ball nut from the steering worm shaft.



INSPECTION AND REPAIR OF STEERING GEAR HOUSING

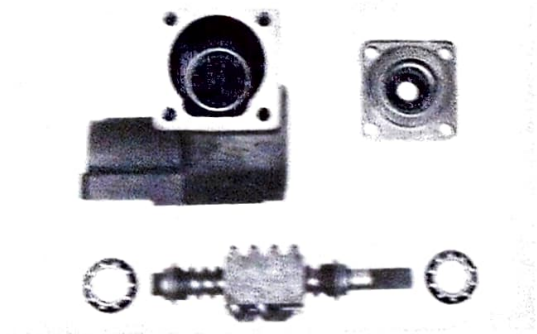
1. INSPECT WORM AND BALL NUT

(a) Check worm and ball nut for wear or damage.

(b) Check that the nut rotates smoothly down the shaft by its own weight.

CAUTION: Do not allow the ball nut to hit the end of the worm shaft.

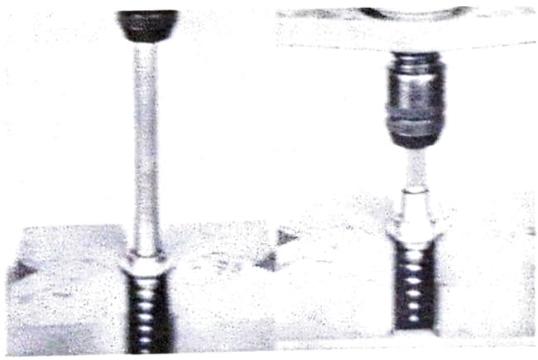
If a problem is found, repair or replace the worm.



2. INSPECT WORM BEARINGS AND RACES

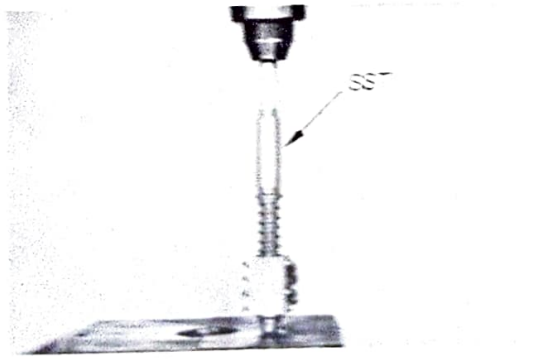
Check for wear or damage.

If a problem is found, replace the bearings, bearing races and oil seal.



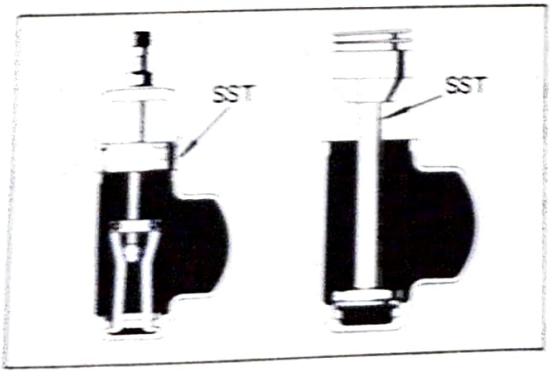
3. IF NECESSARY REPLACE BEARING RACES AND OIL SEAL

(a) Using a press, remove the bearing inner races from the worm shaft.



(b) Using a driver* and press, install the bearing inner races.

*SST 09620-30010 or Commercial driver

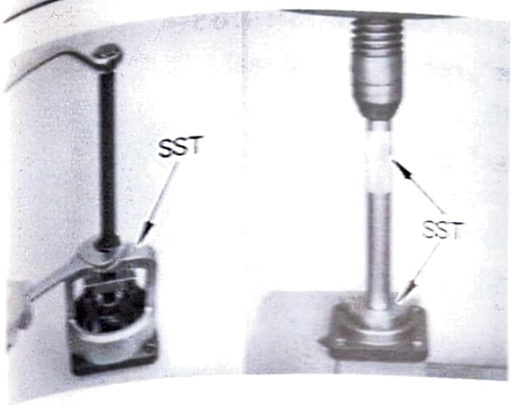


(c) Using a bearing puller*, remove the bearing outer race from the gear housing.

*SST 09612-65013 or Commercial puller

(d) Using a driver* and press, install the bearing outer race.

*SST 09608-35013 or Commercial driver

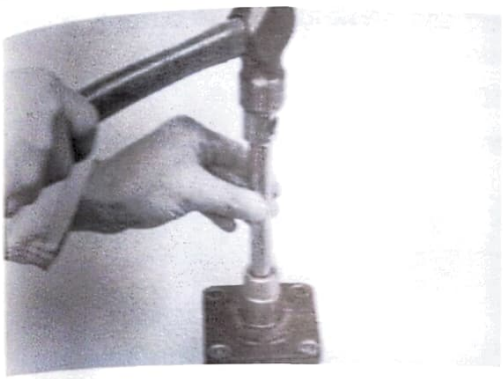


(e) Using a bearing puller*, remove the bearing outer race from the end cover.

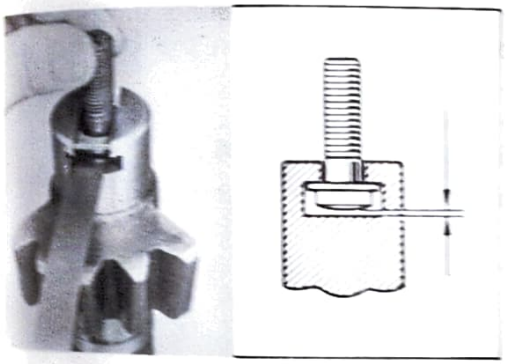
*SST 09612-65013 or Commercial puller

(f) Using a driver* and press, install bearing outer race.

*SST 09608-35013 or Commercial driver



(g) Using a driver and hammer, replace the oil seal with a new one.



4. INSPECT SECTOR SHAFT

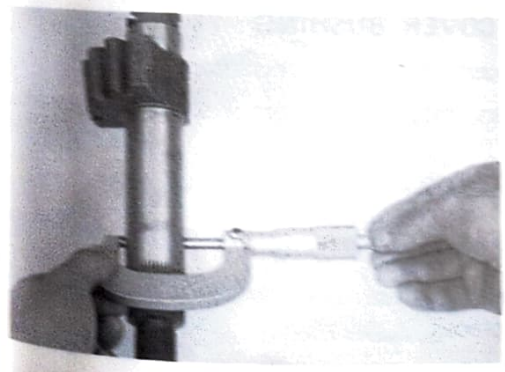
(a) Measure the thrust clearance with a feeler gauge.

Maximum clearance: 0.05 mm (0.0020 in.)

If necessary, install a new thrust washer to provide the minimum clearance between the sector shaft and the adjusting screw.

Thrust washer thickness mm (in.)

Part No.	Thickness	Part No.	Thickness
45362-36010	2.00 (0.0787)	45365-36010	2.15 (0.0846)
45363-36010	2.05 (0.0807)	45366-36010	2.20 (0.0866)
45364-36010	2.10 (0.0827)		

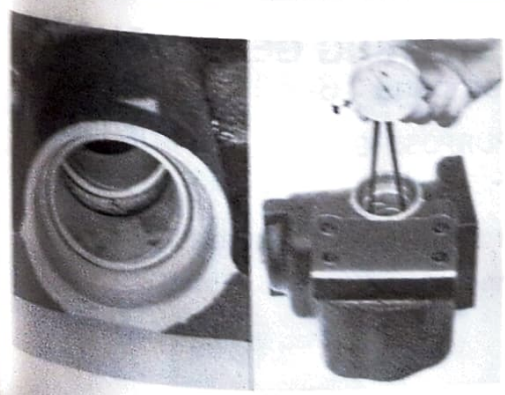


(b) Check the shaft, thrust washer and adjusting screw for wear or damage.

(c) Measure the shaft outer diameter.

Outer diameter:

STD	**31.970 – 31.992 mm (1.2587 – 1.2595 in.)**
Limit	**31.95 mm (1.2579 in.)**



5. INSPECT GEAR HOUSING BUSHINGS

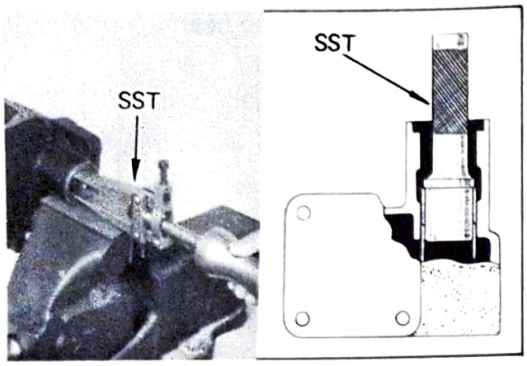
(a) Check the bushings for wear or damage.

(b) Using calipers, measure the sector shaft oil clearance.

Oil clearance:

STD	**0.01 – 0.06 mm (0.0004 – 0.0024 in.)**
Limit	**0.1 mm (0.004 in.)**

If necessary, replace the bushings.



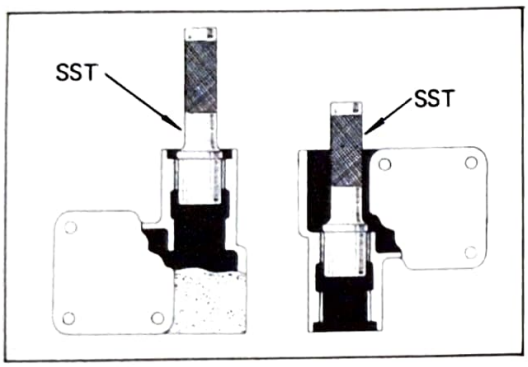
6. IF NECESSARY, REPLACE BUSHINGS

(a) Using a puller*, remove the oil seal.

*SST 09308-00010

(b) Using a driver* and press, remove the two bushings together in the same direction.

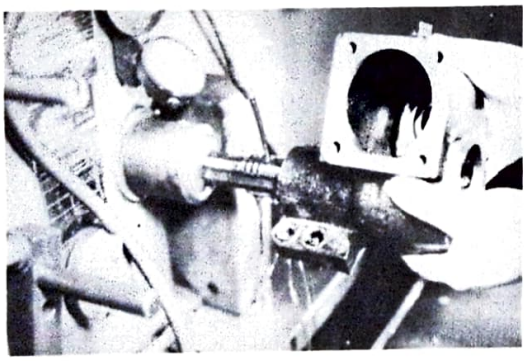
*SST 09307-12010 or Commercial driver



(c) Using a driver* and press, install the outer bushing to the gear housing.

*SST 09307-12010 or Commercial driver

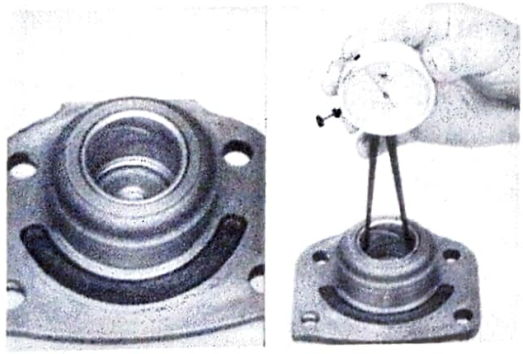
(d) Install the inner bushing by the same procedure.



(e) Hone the inner surface of the bushings until standard oil clearance is obtained between the bushings and sector shaft.

Standard oil clearance:
0.01 – 0.06 mm (0.0004 – 0.0024 in.)

(f) Install the new oil seal to the gear housing.



7. INSPECT END COVER BUSHING

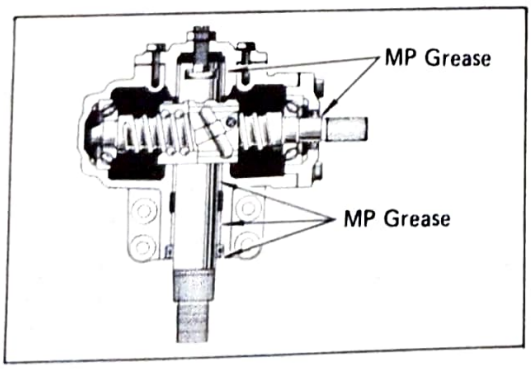
(a) Check the bushing for wear or damage.

(b) Using calipers, measure the sector shaft oil clearance.

Oil clearance:

STD	**0.009 – 0.060 mm (0.0004 – 0.0024 in.)**
Limit	**0.10 mm (0.0039 in.)**

If the oil clearance is excessive or damage is found, the end cover must be replaced.

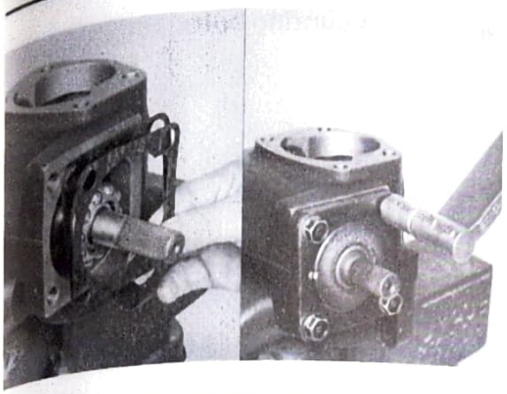


ASSEMBLY OF STEERING GEAR HOUSING (See illustration on page 16-41)

1. APPLY MULTIPURPOSE GREASE TO BUSHINGS AND OIL SEAL

2. INSERT WORM SHAFT INTO GEAR HOUSING

Place worm bearings on the shaft and insert the shaft into the housing.



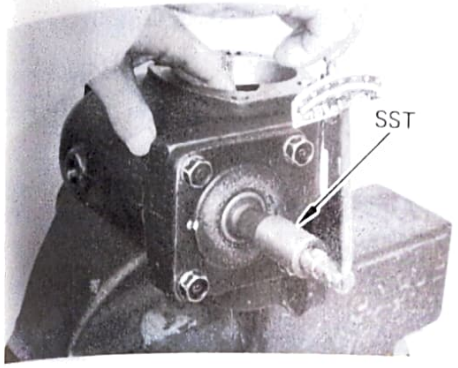
3. INSTALL SHIMS AND END COVER, AND ADJUST WORM BEARING PRELOAD

(a) Install the same amount of shim as there was before disassembly.

(b) Install the end cover and torque the four bolts.

Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)

NOTE: While tightening the bolts, check the worm shaft to see that it turns properly.



(c) Using a torque wrench and socket*, measure the bearing preload in BOTH directions.

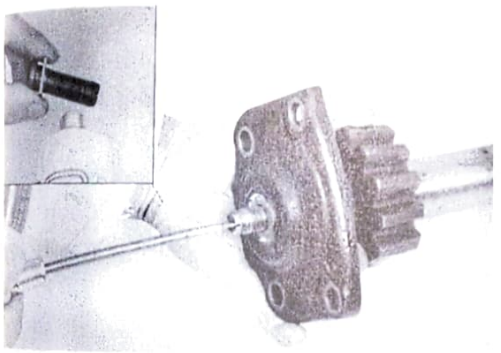
*SST 09616-00010 or 00002-00800

Preload (starting): 3.5 – 6.5 kg-cm (3.0 – 5.6 in.-lb)

If the preload is not within limit, correct by selecting shims of proper thickness.

Shim thickness mm (in.)

Part No.	Thickness	Part No.	Thickness
45323-36010	0.05 (0.0020)	45323-36080	0.09 (0.0035)
45323-36070	0.06 (0.0024)	45323-36040	0.10 (0.0039)
45323-36020	0.07 (0.0028)	45323-36050	0.20 (0.0079)
45323-36030	0.08 (0.0031)	45323-36060	0.50 (0.0197)

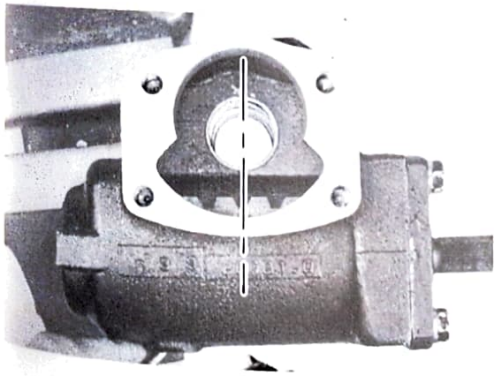


4. INSTALL SECTOR SHAFT AND END COVER

(a) Apply liquid sealer to the adjusting screw thread and insert it in the thrust washer.

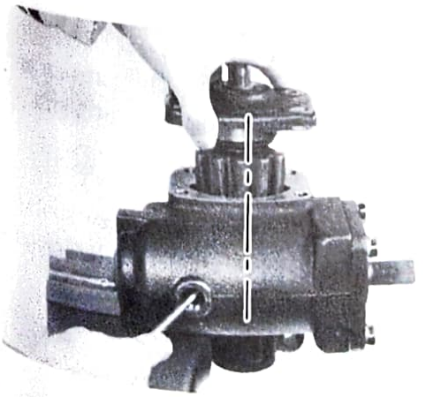
(b) Assemble the sector shaft and adjusting screw to the end cover.

NOTE: Fully loosen the adjusting screw.

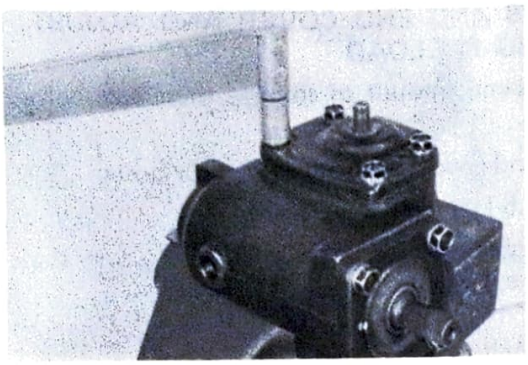


(c) Apply liquid sealer to the gear housing.

(d) Set and support the ball nut at the center of the gear housing by inserting a screwdriver into the breather plug hole.



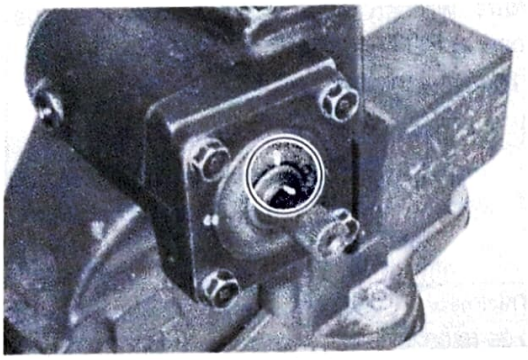
(e) Insert the sector shaft into the gear housing so that the center teeth mesh together.



(f) Tighten the end cover mounting bolts.

Torque the four bolts.

Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)

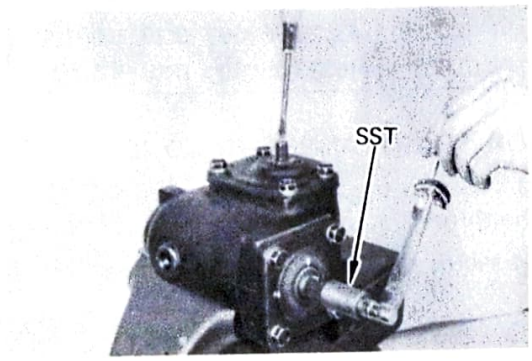


5. PLACE WORM SHAFT IN NEUTRAL POSITION

Count the total shaft rotations and turn the shaft back half of that number. The worm shaft is now in neutral position.

6. MARK WORM SHAFT AND HOUSING

Place an alignment mark on the worm shaft and housing to show neutral position.



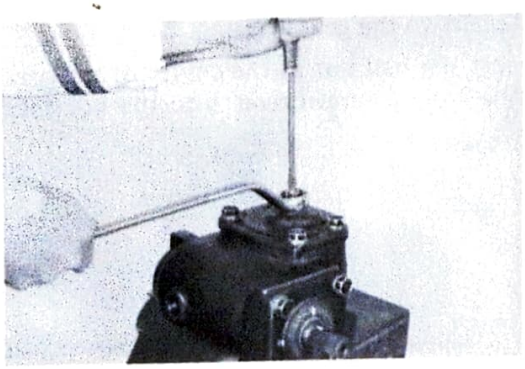
7. ADJUST OVERALL PRELOAD

Using a torque wrench and socket*, turn the adjusting screw while measuring the preload until the preload is correct.

*SST 09616-00010 or 00002-00800

NOTE: Be sure that the worm shaft is in neutral position.

Preload (starting): Worm bearing preload plus 4.5 kg-cm (3.9 in.-lb)

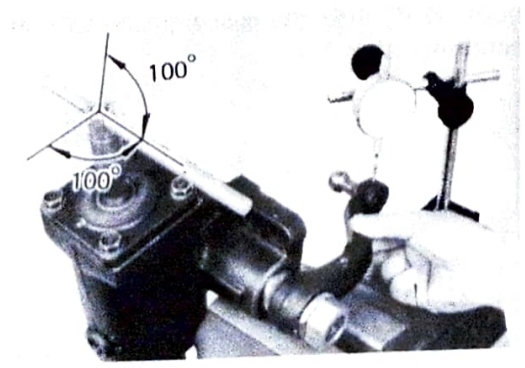


8. TIGHTEN ADJUSTING SCREW LOCK NUT

Hold the screw with a screwdriver while tightening the lock nut. Torque the lock nut.

Torque: 3.5 – 5.0 kg-m (26 – 36 ft-lb)

NOTE: Check that the preload is still correct.

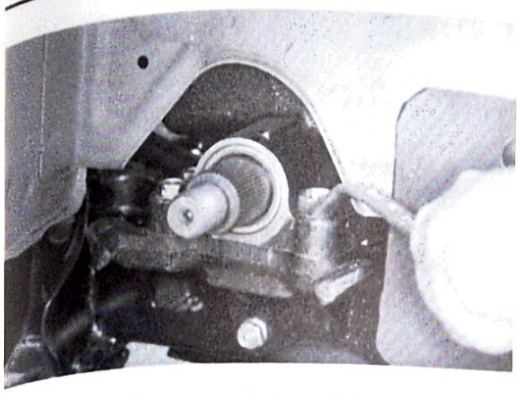


9. INSTALL PITMAN ARM

Align the marks on the sector shaft with the pitman arm. Install the pitman arm and tighten the nut finger tight.

10. MEASURE SECTOR SHAFT BACKLASH

Install the backlash gauge. Check that the sector shaft has backlash 0 – 0.27 mm (0 – 0.0106 in.) within 100 degrees of the left and right sides from neutral position.

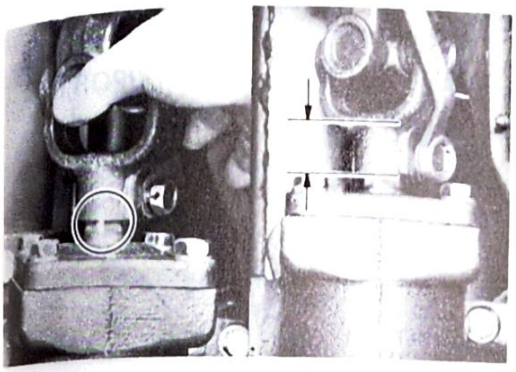


INSTALLATION OF STEERING GEAR HOUSING
(See illustration on page 16-40)

1. INSTALL GEAR HOUSING

   Install the housing with four bolts. Torque the bolts.

   Torque: 5.0 – 6.5 kg-m (37 – 47 ft-lb)



2. CONNECT INTERMEDIATE SHAFT TO WORM SHAFT

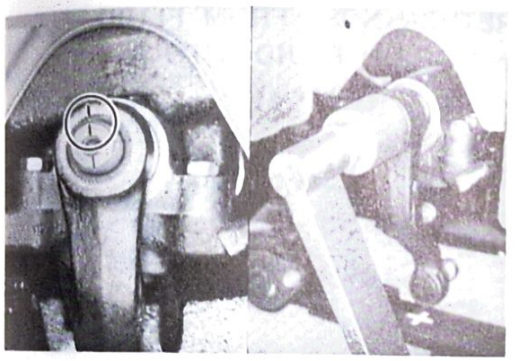
   (a) Align the matching marks on the joint yoke and worm shaft.

   (b) Compress and install the intermediate shaft onto the worm shaft.

   Depth: Manual steering 27 mm (1.06 in.)
   Power steering 34 mm (1.34 in.)

   (c) Tighten the joint yoke bolt.

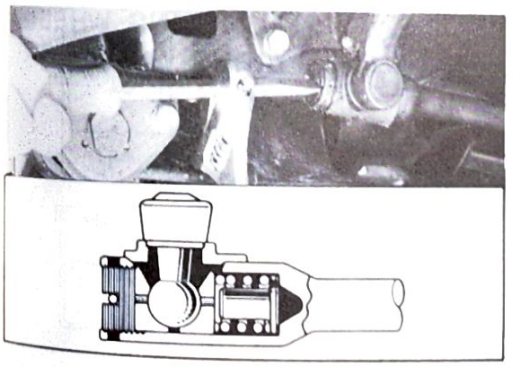
   Torque: 3.0 – 4.5 kg-m (22 – 32 ft-lb)



3. INSTALL PITMAN ARM

   Align the matching marks on the sector shaft. Torque the nut.

   Torque: 16.0 – 19.0 kg-m (116 – 137 ft-lb)

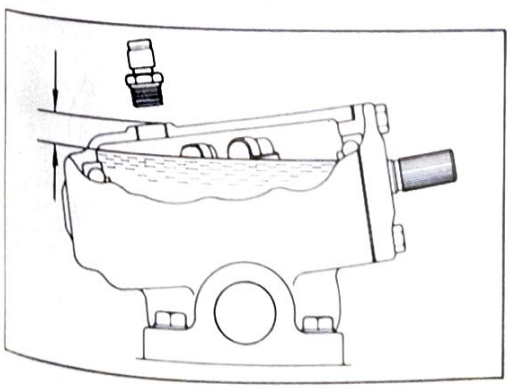


4. CONNECT DRAG LINK

   (a) Insert the pitman arm in the drag link.

   (b) Tighten the plug completely and then loosen 1-1/3 turns.

   (c) Secure the plug by inserting a cotter pin.



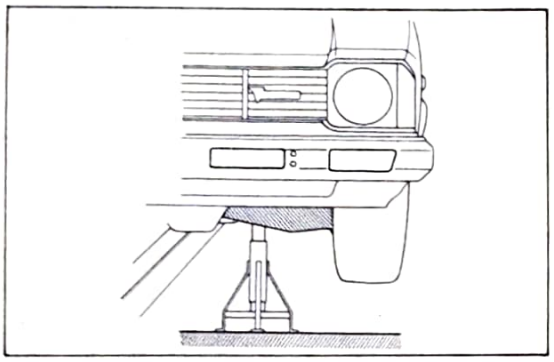
5. FILL GEAR HOUSING WITH GEAR OIL

   Oil level: 12 – 17 mm (0.47 – 0.67 in.) from top
   Capacity: 580 cc (35.4 cu in.)

POWER STEERING

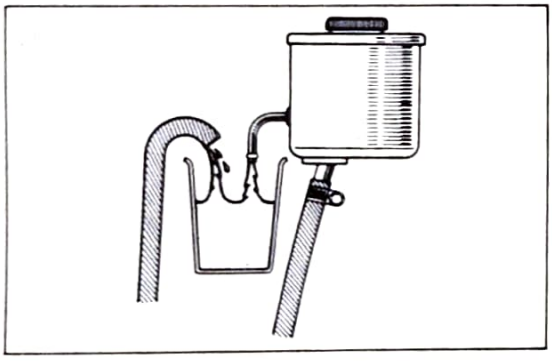
On-Vehicle Inspection

CHECK OF POWER STEERING FLUID

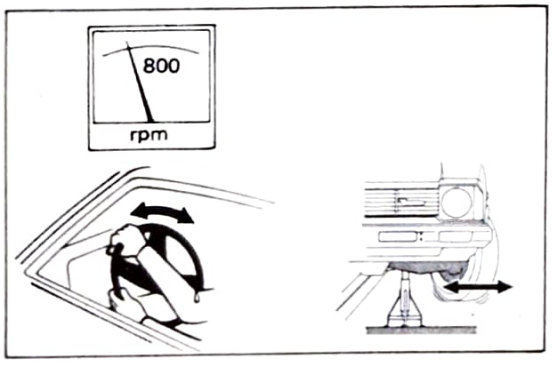


FLUID REPLACEMENT

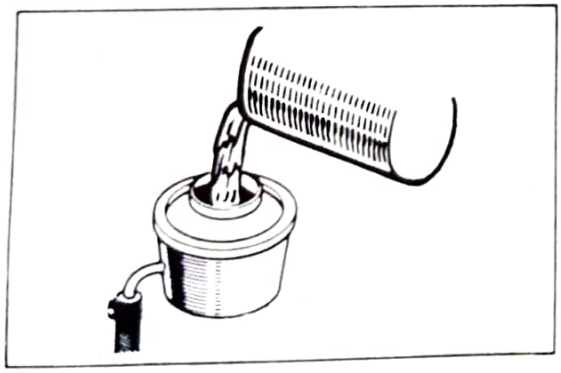
1. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS



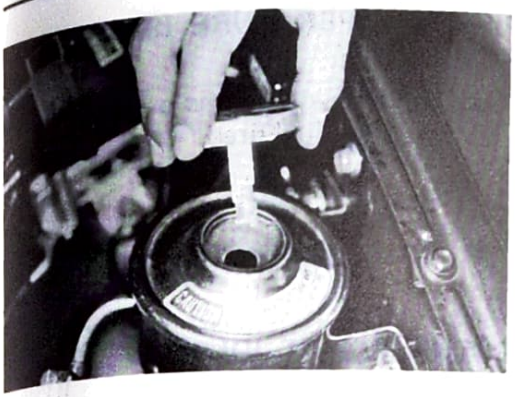
2. DISCONNECT RETURN HOSE FROM FLUID RESERVOIR AND DRAIN FLUID INTO A CONTAINER



3. WITH ENGINE IDLING, TURN STEERING WHEEL FROM FULL LEFT TO FULL RIGHT WHILE DRAINING FLUID



4. CONNECT HOSE TO FLUID RESERVOIR
5. FILL RESERVOIR WITH FRESH FLUID ATF TYPE DEXRON
6. BLEED POWER STEERING SYSTEM

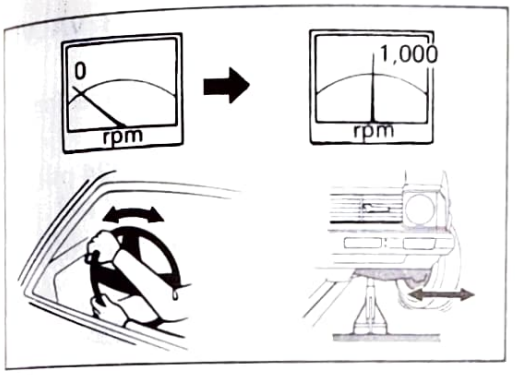


BLEEDING OF POWER STEERING SYSTEM

1. CHECK FLUID LEVEL IN RESERVOIR

   Add fluid if low.

   Fluid: ATF type Dexron



2. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS

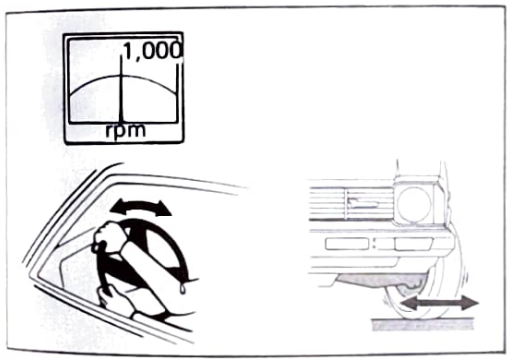
3. TURN STEERING WHEEL FULLY IN BOTH DIRECTIONS TWO OR THREE TIMES

4. RECHECK FLUID LEVEL IN RESERVOIR

   Add fluid if low.

5. START ENGINE AND TURN STEERING WHEEL FULLY IN BOTH DIRECTIONS TWO OR THREE TIMES

   Run the engine at 1,000 rpm or less.

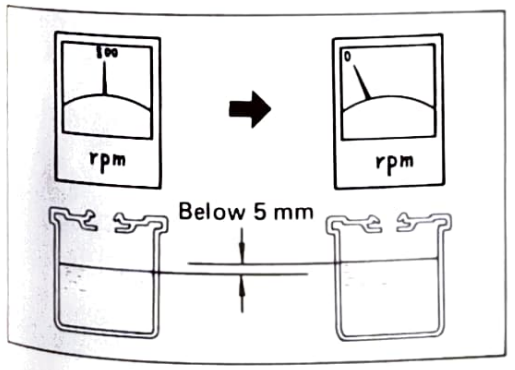


6. LOWER FRONT OF VEHICLE

   Remove the jack stand and lower the vehicle completely.

7. WITH ENGINE AT 1,000 RPM OR LESS, TURN STEERING WHEEL FULLY IN BOTH DIRECTIONS TWO OR THREE TIMES

   Return the steering wheel to center position.

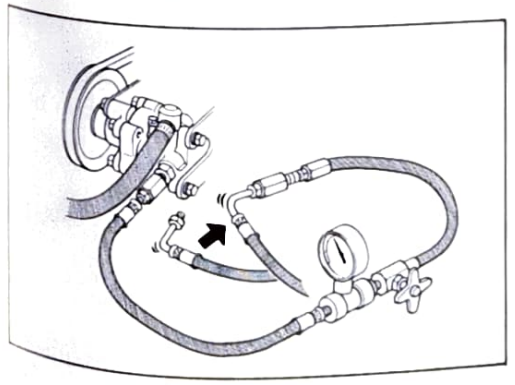


8. CHECK THAT FLUID IN RESERVOIR IS NOT FOAMY OR CLOUDY AND DOES NOT RISE OVER MAXIMUM WHEN ENGINE IS STOPPED

   Measure fluid level with the engine running. Stop the engine and measure the fluid level.

   Maximum rise: 5 mm (0.20 in.)

   If a problem is found, repeat steps 7 and 8. Repair the vane pump if the problem continues.



POWER STEERING PRESSURE CHECK

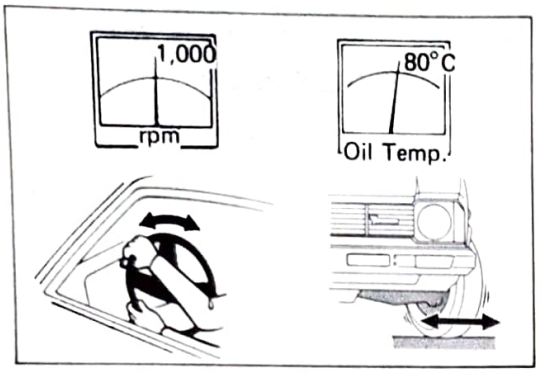
1. CONNECT PRESSURE GAUGE

   (a) Using a flarenut wrench*, remove the pressure line from the vane pump.

   *SST 09631-22020 or Commercial wrench

   (b) Connect the gauge side of the pressure gauge to the vane pump and the valve side to the pressure line.

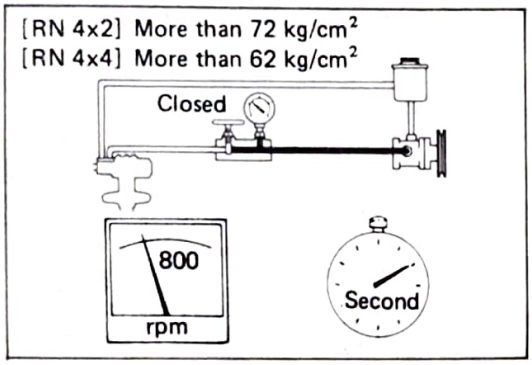
   (c) Bleed the system and check that the fluid level is correct.



2. **CHECK THAT FLUID TEMPERATURE IS AT LEAST 80°C (176°F)**

Turn the wheel fully in both directions a few times to increase the fluid temperature if required.

3. **START ENGINE AND RUN AT IDLE**



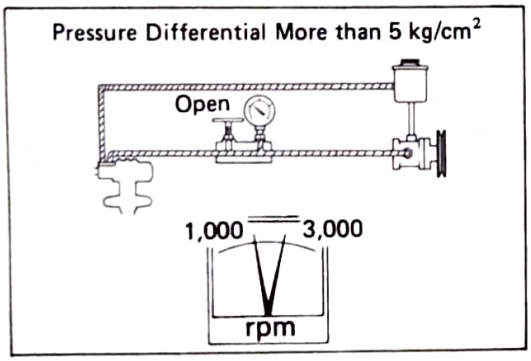
4. **CHECK FLUID PRESSURE READING WITH VALVE CLOSED**

Close the pressure gauge valve and observe the reading on the gauge.

Minimum pressure: **RN 4x2** **72 kg/cm² (1,024 psi)**
RN 4x4 **62 kg/cm² (882 psi)**

NOTE: Do not keep the valve closed for more than 10 seconds.

If pressure is low, repair or replace the vane pump.



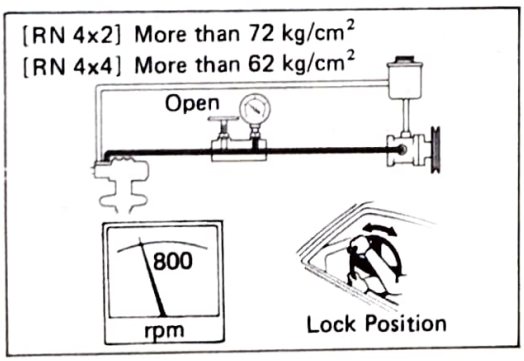
5. **OPEN VALVE FULLY**

6. **CHECK AND RECORD PRESSURE READING AT 1,000 RPM**

7. **CHECK AND RECORD PRESSURE READING AT 3,000 RPM**

Check that there is less than 5 kg/cm² (71 psi) difference in pressure between the 1,000 and 3,000 rpm checks.

If the difference is greater, repair or replace the vane pump flow control valve.

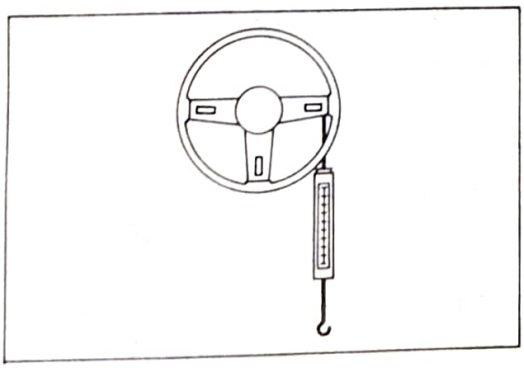


8. **CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK**

Be sure the pressure gauge valve is fully open and the engine is idling.

Minimum pressure: **RN 4x2** **72 kg/cm² (1,024 psi)**
RN 4x4 **62 kg/cm² (882 psi)**

If pressure is low, the gear box has an internal leak and must be repaired or replaced.



9. **MEASURE STEERING EFFORT**

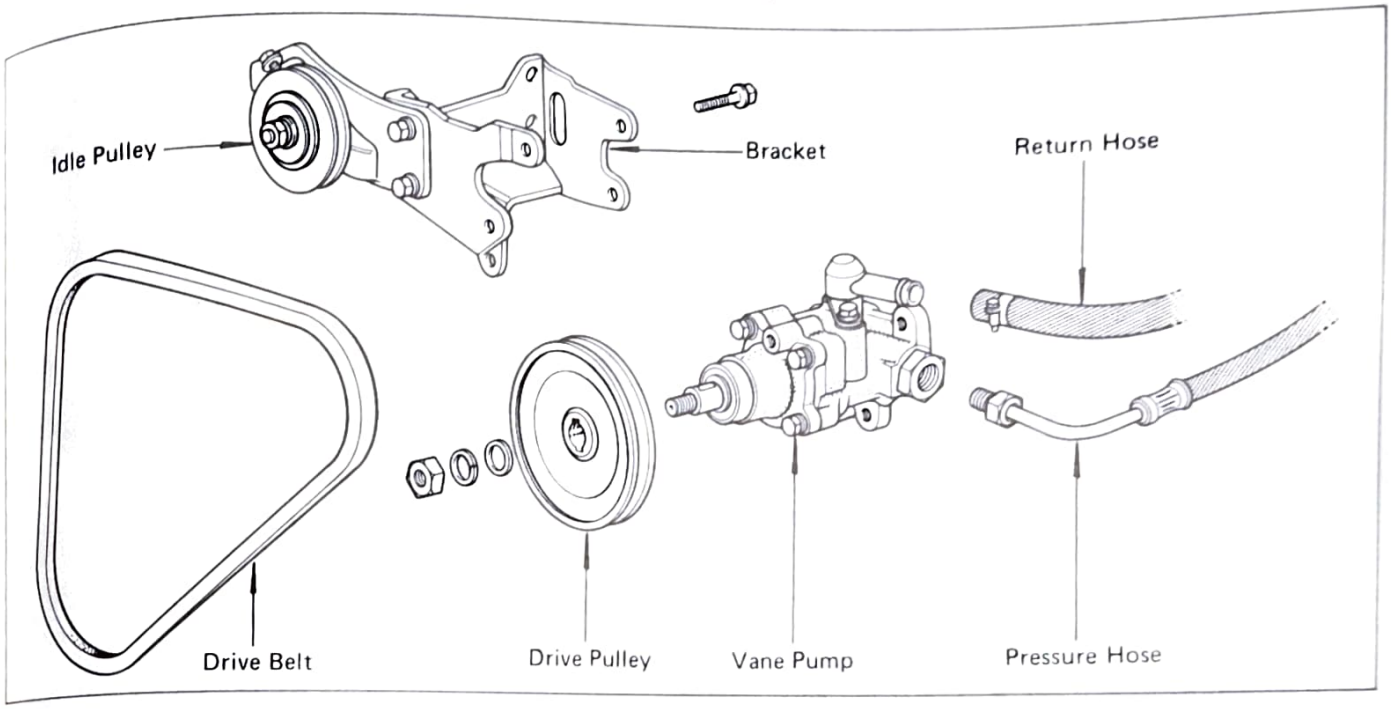
Center the steering wheel and run the engine at idle. Using a scale, measure steering effort to full lock in both directions.

Maximum steering effort: 3.5 kg (7.7 lb)

If steering effort is excessive, repair the power steering unit.

NOTE: Be sure to consider tire type, pressure, and contact surface before making your diagnosis.

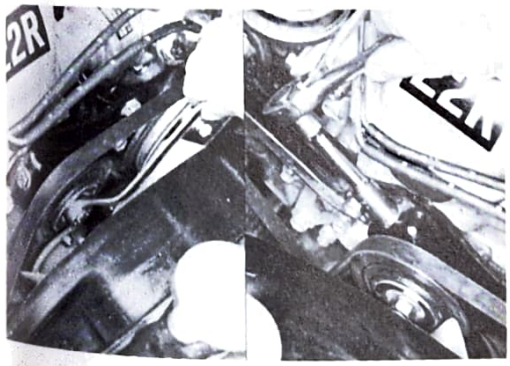
Vane Pump



REMOVAL OF VANE PUMP

1. REMOVE DRIVE BELT AND PULLEY

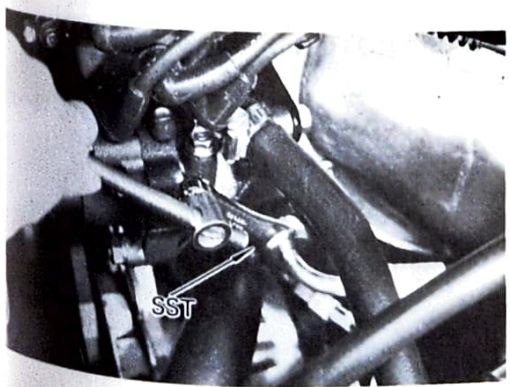
(a) Push on the drive belt to hold the pulley in place and loosen the pulley nut.



(b) Loosen the idler pulley nut.

(c) Loosen the adjusting bolt and remove the drive belt.

(d) Remove the drive pulley.



2. DISCONNECT PRESSURE LINE

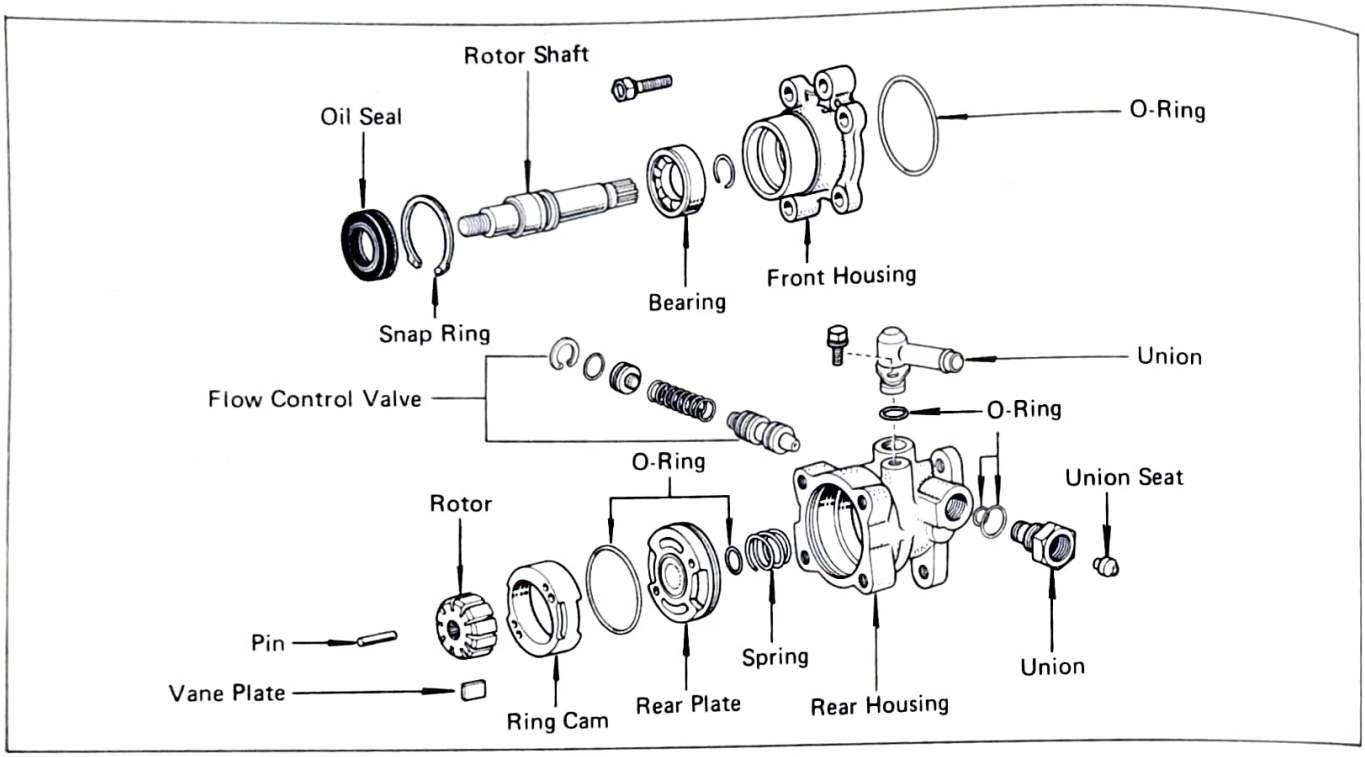
Using a flare nut wrench*, loosen and disconnect the pressure line.

*SST 09631-22020 or Commercial wrench

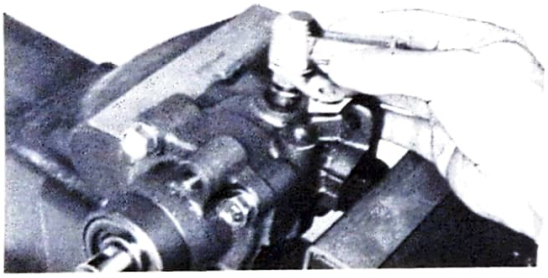
3. DISCONNECT RETURN LINE HOSE

Loosen hose clamp and pull off the hose.

4. REMOVE VANE PUMP



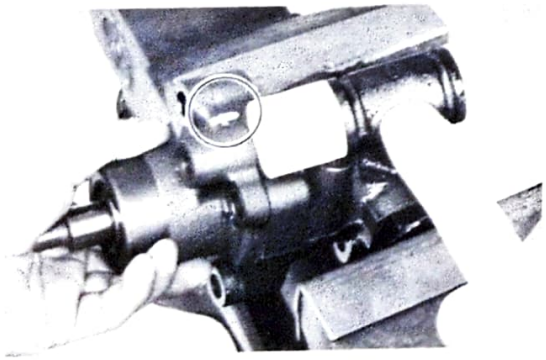
DISASSEMBLY OF VANE PUMP



1. CLAMP VANE PUMP IN VISE

   CAUTION: Do not tighten vise too tight.

2. REMOVE UNION FROM REAR HOUSING



3. MARK FRONT AND REAR HOUSINGS

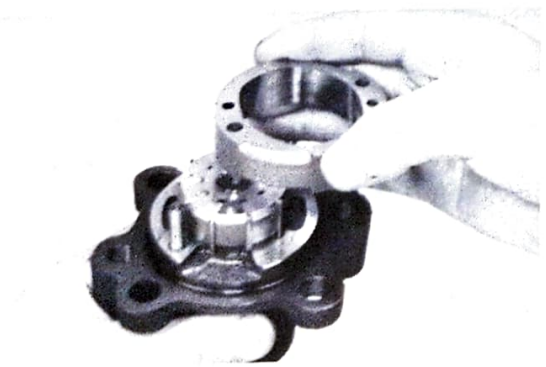
   Mark these parts to ensure correct reassembly.

4. REMOVE FRONT HOUSING

   (a) Remove four front housing bolts.

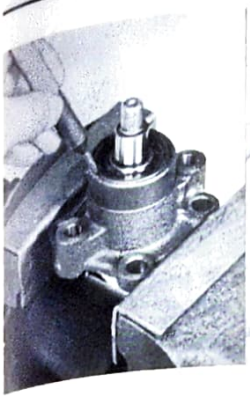
   (b) Using a plastic hammer, tap off the front housing.

   CAUTION: Be careful that the vane plates, rotor and cam ring do not fall out.



5. REMOVE RING CAM, ROTOR AND VANE PLATES

   CAUTION: Be careful not to scratch the ring cam, rotor or vane plates.



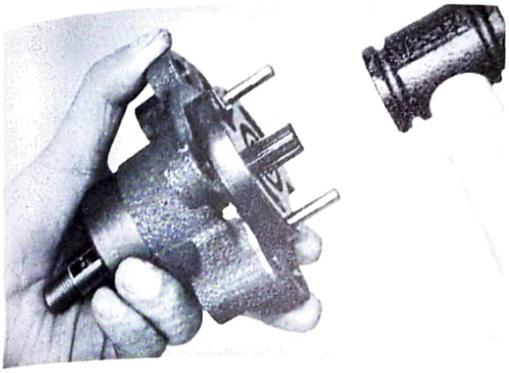
6. REMOVE ROTOR SHAFT

(a) Clamp the front housing in a vise.

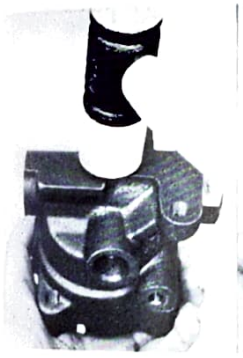
CAUTION: Do not tighten the vise too tight.

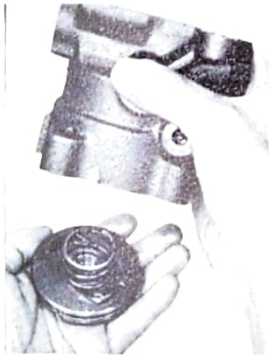
(b) Using a chisel and hammer, pry off the oil seal.

(c) Using snap ring pliers, remove the snap ring.



(d) Using a plastic hammer, lightly tap the rotor shaft out of the front housing.

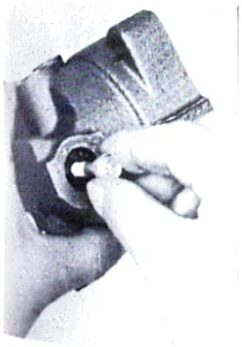




7. REMOVE REAR PLATE AND SPRING

Using a plastic hammer, tap the bottom end of the rear housing, and remove the rear plate and spring.

CAUTION: **Avoid gripping the rear plate with pliers as this could mar it.**



8. REMOVE FLOW CONTROL VALVE

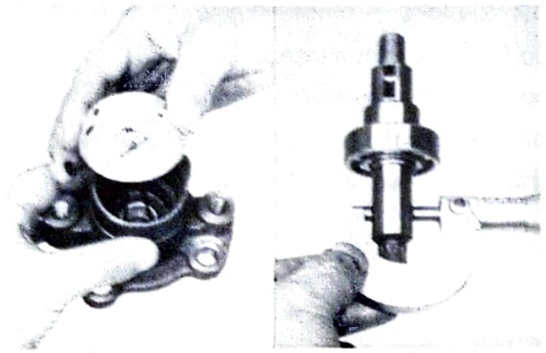
(a) Temporarily install a bolt to the plug.

(b) Push the bolt and remove the snap ring with snap ring pliers.

(c) Pull out the bolt and remove the plug.

(d) Remove the spring and flow control valve by hand.

CAUTION: **Use care not to drop, scratch or nick this valve.**



INSPECTION OF VANE PUMP

1. **INSPECT BUSHING AND MEASURE BUSHING OIL CLEARANCE**

   (a) Check bushing for wear or damage. The bushing cannot be replaced separately.

   If wear or damage is found, replace entire housing.

   (b) Check the oil clearance between the bushing and rotor shaft.

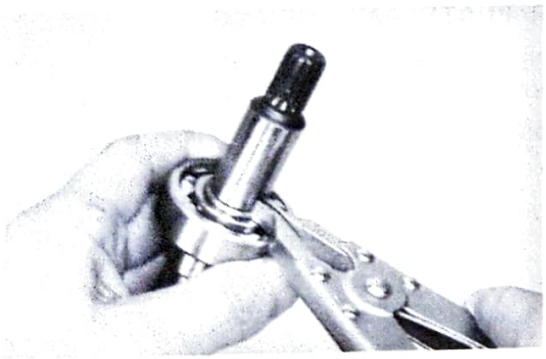
   Maximum oil clearance: 0.07mm (0.0028 in.)

2. **INSPECT ROTOR SHAFT**

   (a) Check the rotor shaft for wear or damage.

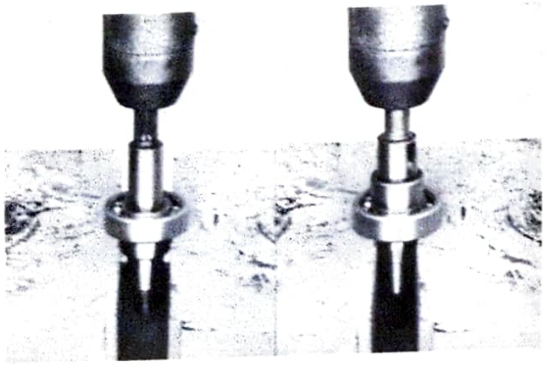
   (b) Check that the rotor shaft bearing rotates smoothly.

   If the bearing is scratched or damaged, replace it.



3. **IF NECESSARY, REPLACE ROTOR SHAFT BEARING**

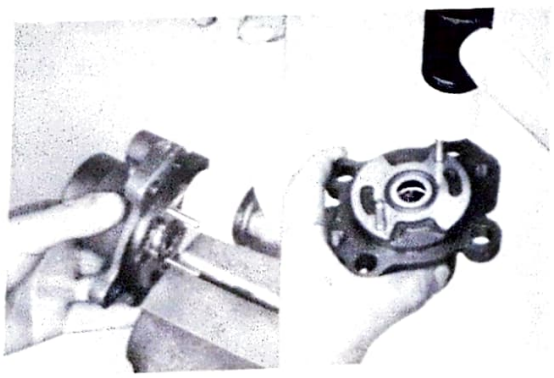
   (a) Using snap ring pliers, remove the snap ring.



   (b) Using a press, press out the bearing.

   (c) Using a press, press in the bearing.

   (d) Using snap ring pliers, install the snap ring.



4. **INSPECT FRONT HOUSING PINS**

   Check the pins for wear or damage.

5. **IF NECESSARY, REPLACE PINS**

   (a) Clamp the pins, one at a time, in a vise and remove them by tapping the housing with a plastic hammer.

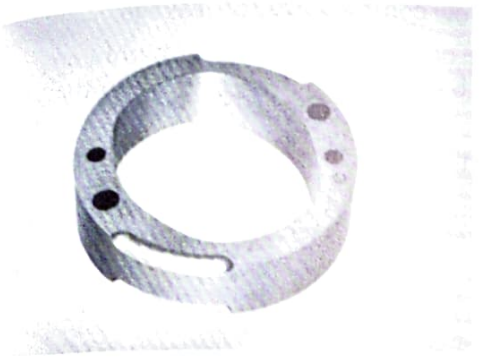
   (b) Using a plastic hammer, tap two new pins into the housing.

6. INSPECT AND MEASURE ROTOR

(a) Check the rotor surface for wear, scratches or scoring.

(b) Measure the thickness of the rotor and record it.

If a problem is found, replace the rotor.



7. INSPECT AND MEASURE CAM RING

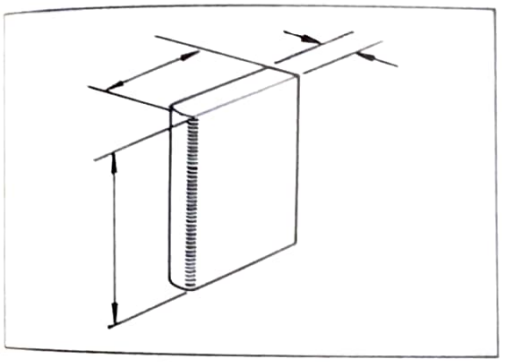
(a) Check the inner surface for wear, scratches or scoring.

If a problem is found, replace the cam ring.

(b) Measure the thickness of the cam ring. Check that the difference between the rotor and cam ring measurement is less than maximum.

Maximum difference: 0.06 mm (0.0024 in.)

If difference is excessive, replace the cam.

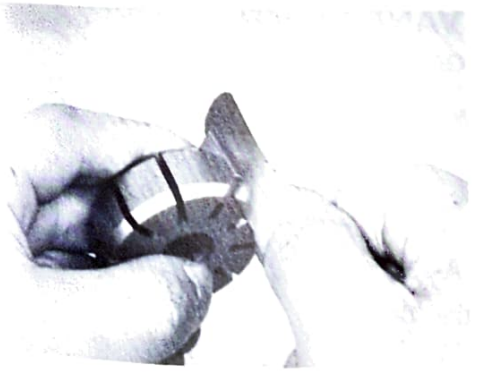


8. INSPECT AND MEASURE VANE PLATES

(a) Check the vane plates for wear or scratches.

(b) Measure the length, height and width of the vane plates.

Minimum length: 14.97 mm (0.5894 in.)
Minimum height: 7.8 mm (0.307 in.)
Minimum width: 1.7 mm (0.067 in.)



(c) Measure the clearance between the vane plate and rotor groove.

Maximum clearance: 0.06 mm (0.0024 in.)

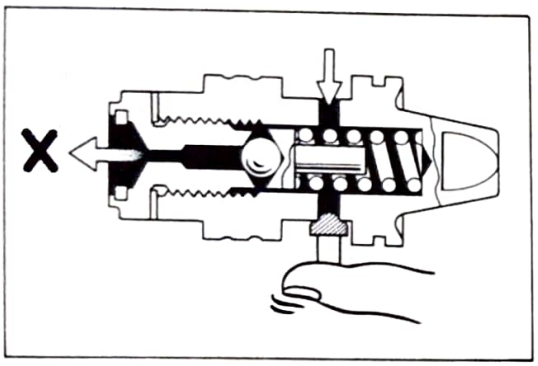
9. INSPECT REAR PLATE

Check the rear plate for wear, scratches or scoring.

10. INSPECT FLOW CONTROL VALVE AND MEASURE SPRING

(a) Check the flow control valve for wear or damage.

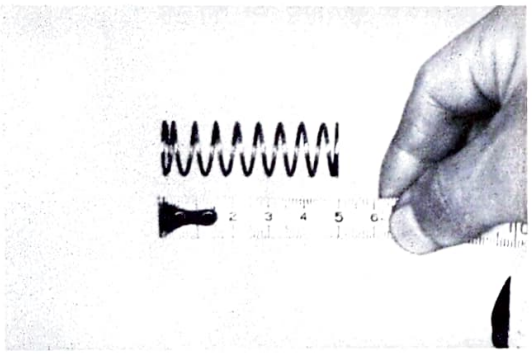
(b) Apply fluid to the valve and check that it falls smoothly into the valve hole by its own weight.



(c) Check the flow control valve for leakage.

- Close the one of the holes and apply compressed air [4 or 5 kg/cm² (57 or 71 psi)] into the opposit side.
- Confirm that air does not come out from the end hole.

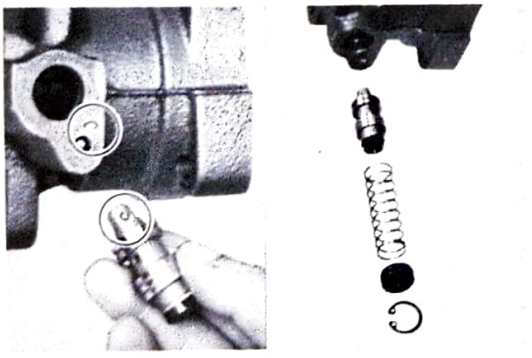
Replace as required with the same letter as stamped on the rear housing.



(d) Check that the spring is within specification.

Spring length: 47 – 50 mm (1.85 – 1.97 in.)

If the spring is not within specification, replace the spring.



ASSEMBLY OF VANE PUMP
(See illustration on page 16-52)

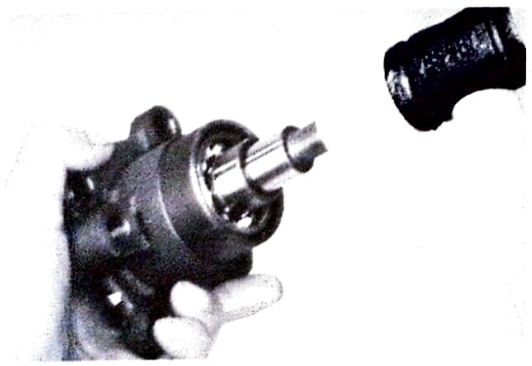
1. INSTALL FLOW CONTROL VALVE

NOTE: Be sure the letter inscribed on the flow control valve matches the letter stamped on the rear of the pump body.

Inscribed mark: A–E

(a) Lubricate the flow control valve and spring with ATF.

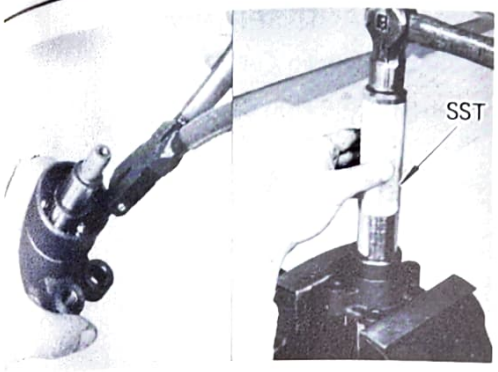
(b) Install the flow control valve, spring, plug and snap ring.



2. INSTALL ROTOR SHAFT TO FRONT HOUSING

(a) Lubricate the rotor shaft with ATF.

(b) Install the rotor shaft into the front housing by tapping it in with a plastic hammer.



3. INSTALL SNAP RING

Using snap ring pliers, install the snap ring to the front housing.

4. INSTALL OIL SEAL

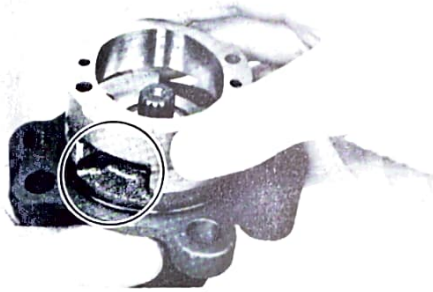
(a) Apply a light coat of multipurpose grease to the oil seal lip.

(b) Using a driver* and hammer, install the oil seal.

*SST 09608-30011 or Commercial driver

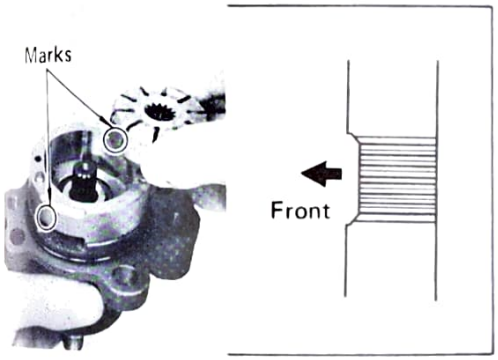
5. INSTALL O-RING

Lubricate and install the O-ring onto the front housing.



6. INSTALL RING CAM

Align the fluid passages of the ring cam and front housing, and install the ring cam.



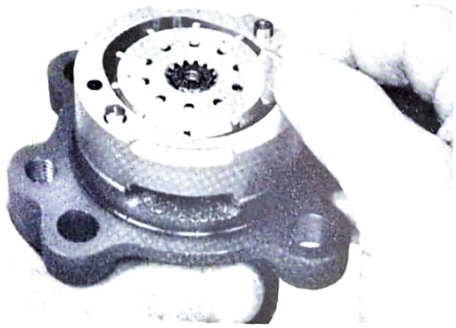
7. INSTALL ROTOR

(a) Lubricate the rotor with ATF.

(b) Install the rotor with the cut spline side facing toward the front housing.

NOTE: Be sure the letters inscribed on the ring cam and rotor are matching.

Inscribed mark: 1 – 4 or None

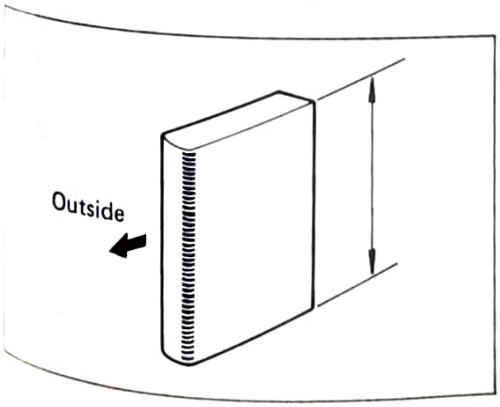


8. INSTALL VANE PLATES

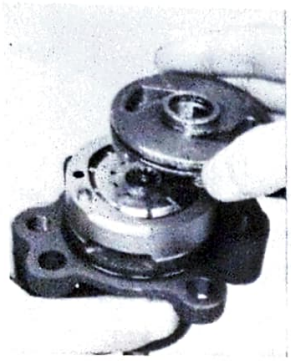
(a) Lubricate the vane plates with ATF.

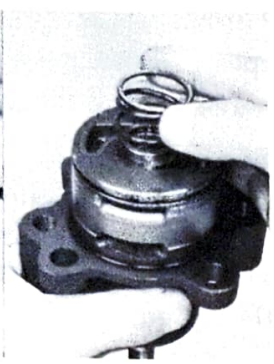
(b) Install the vane plates with the round end facing outward.

NOTE: There are five vane lengths with the following rotor and cam ring marks:



Rotor and cam ring mark	Vane Part No.	Vane length mm (in.)
None	44345–12010	14.996–14.998 (0.5904–0.5905)
1	44345–12020	14.994–14.996 (0.5903–0.5904)
2	44345–12030	14.992–14.994 (0.5902–0.5903)
3	44345–12040	14.990–14.992 (0.5902–0.5902)
4	44345–12050	14.988–14.990 (0.5901–0.5902)



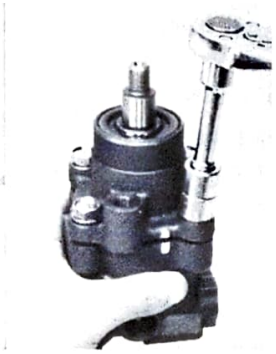


9. INSTALL REAR PLATE AND SPRING

(a) Lubricate and install the two O-rings to the rear plate.

(b) Place the rear plate on the ring cam with the pin holes aligned with the pins.

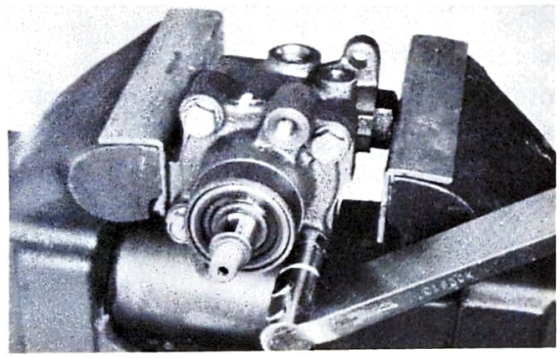
(c) Place the spring on the rear plate.



10. INSTALL REAR HOUSING

(a) Align the matchmarks on the front and rear housings, and assemble them.

(b) Half tighten the front and rear housing mounting bolts.

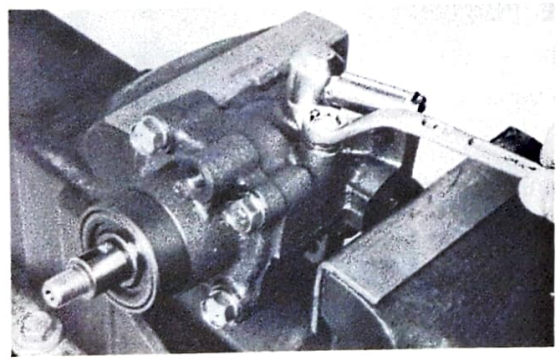


11. TIGHTEN FOUR HOUSING BOLTS

(a) Clamp the rear housing in a vise.

(b) Tighten the four housing bolts evenly 3 or 4 times.

Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)

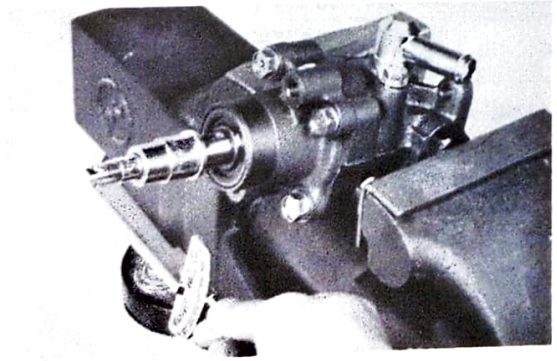


12. INSTALL UNION TO REAR HOUSING

(a) Lubricate and install the O-ring to the union.

(b) Insert and tighten the union

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)

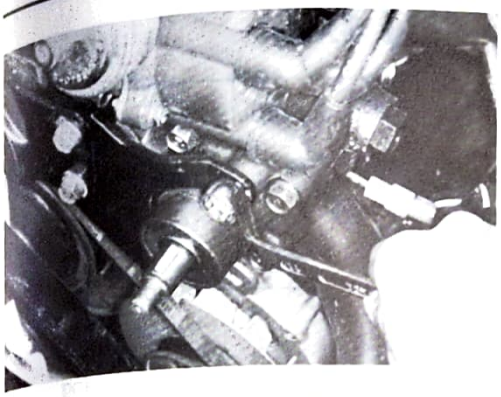


13. CHECK ROTOR SHAFT ROTATION CONDITION

(a) Check that the rotor shaft rotates smoothly without abnormal noise.

(b) Provisionally install the pulley nut and check the rotating torque.

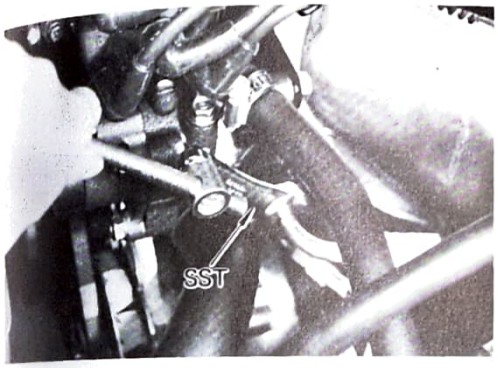
Rotating torque: Less than 2.75 kg-cm (239 in-lb)



INSTALLATION OF VANE PUMP (See illustration on page 16-51)

1. INSTALL VANE PUMP

Place the vane pump in position and install mounting bolts.



2. CONNECT RETURN LINE HOSE

Push the hose on the fitting and tighten the clamp.

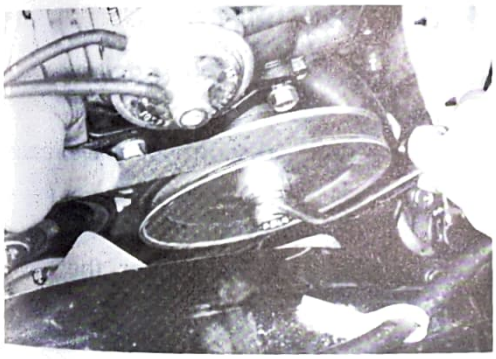
3. CONNECT PRESSURE LINE

Carefully connect the pressure line. Using a flare nut wrench*, tighten the connection.

Torque: 4.0 – 5.0 kg-m (29 – 36 ft-lb)

NOTE: Check that there is sufficient clearance between the hose and exhaust manifold.

*SST 09631-22020 or Commercial wrench

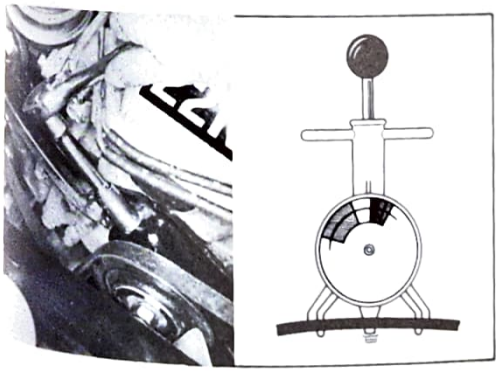


4. INSTALL DRIVE PULLEY AND BELT

(a) Install the key in the propeller shaft and push on the pulley.

(b) Push down on the drive belt to hold the pulley in place and torque the pulley set nut.

Torque: 4.5 – 5.5 kg-m (33 – 39 ft-lb)



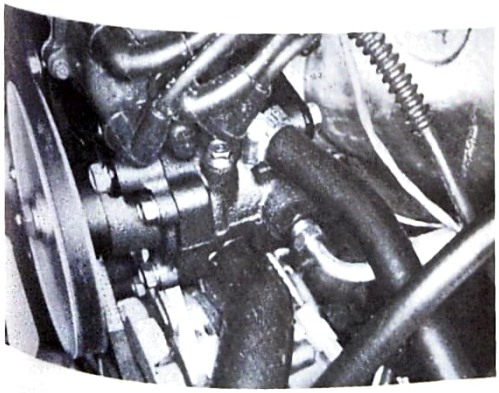
5. ADJUST DRIVE BELT TENSION

(a) Turn the adjusting bolt until the belt tension is at specified value.

(b) Tighten the idler pulley nut and adjusting bolt.

Drive belt tension:

New belt 125 ± 25 lb
Used belt 80 ± 20 lb
(W/ Borroughs drive belt tension gauge No.BT-33-73F)



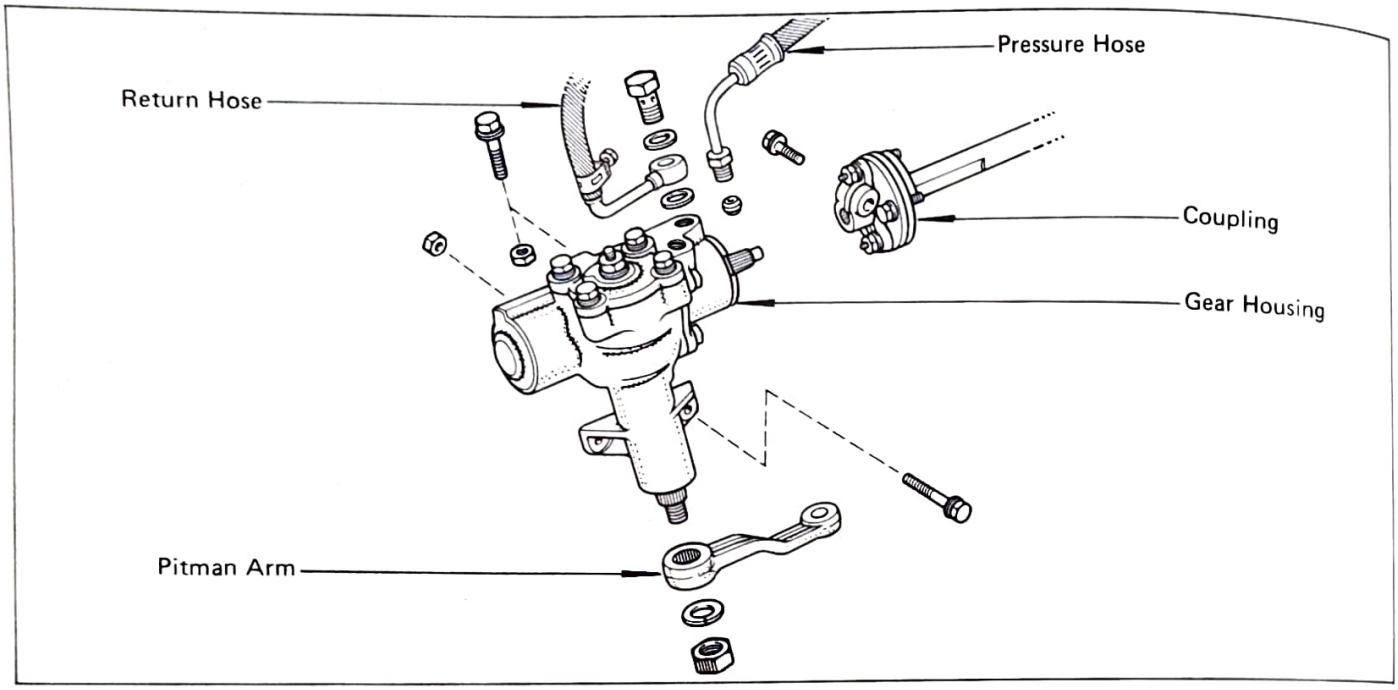
6. FILL RESERVOIR WITH FLUID

Fluid: ATF type Dexron

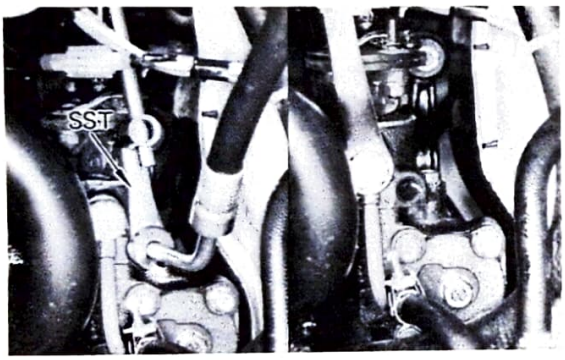
7. BLEED POWER STEERING (See page 16-49)

8. CHECK FOR FLUID LEAKS

Gear Housing (RN 4x2)



REMOVAL OF GEAR HOUSING

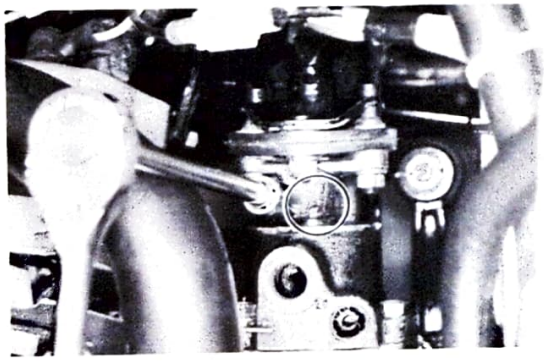


1. DISCONNECT RETURN LINE AND PRESSURE LINE

(a) Using a flare nut wrench*, disconnect the pressure line.

*SST 09631-22020 or Commercial wrench

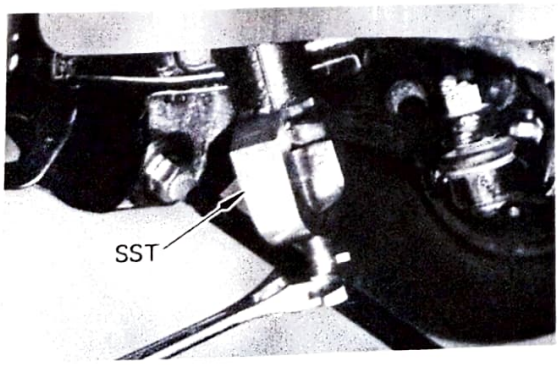
(b) Remove the union bolt and disconnect the return line.



2. MARK COUPLING AND WORM SHAFT

Place an alignment mark on the coupling and worm shaft to ensure correct reassembly.

3. REMOVE COUPLING BOLT



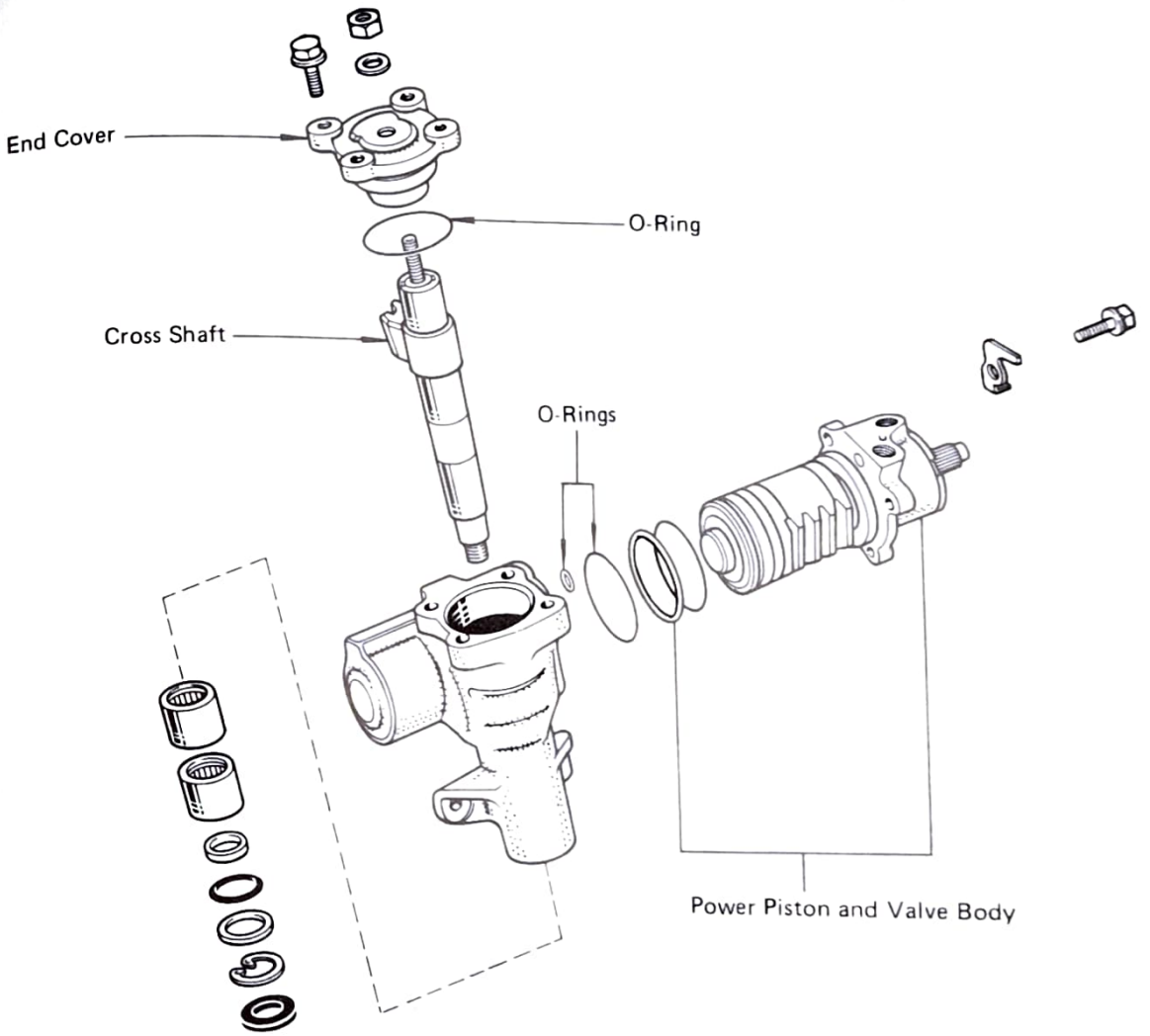
4. DISCONNECT PITMAN ARM FROM GEAR HOUSING

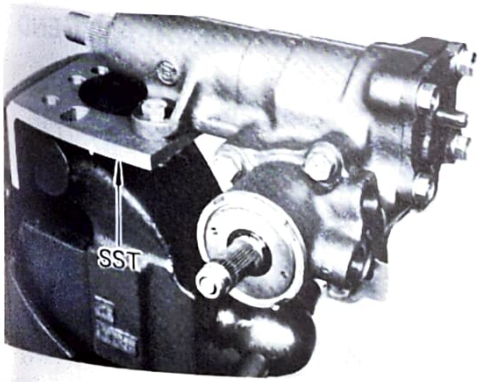
Remove the pitman arm set nut. Using a pitman arm puller*, disconnect the pitman arm from the gear housing.

*SST 09610-55012

5. REMOVE GEAR HOUSING

Remove three bolts and pull gear housing from the coupling.



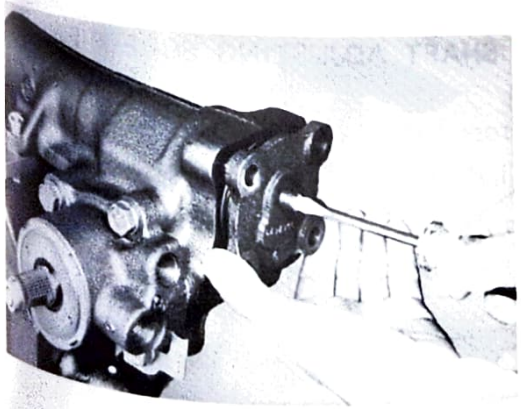


DISASSEMBLY OF GEAR HOUSING

1. MOUNT HOUSING ON STAND

Mount the gear housing on a stand* and clamp the stand in a vise.

*SST 09630-00010

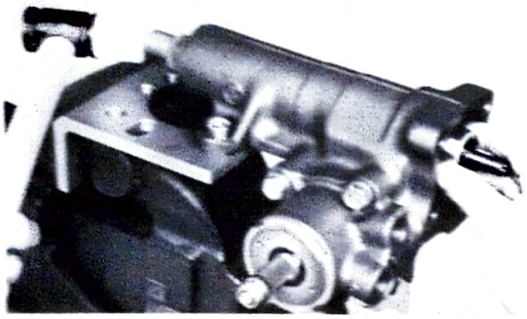


2. REMOVE CROSS SHAFT END COVER

(a) Remove the adjusting screw lock nut and washer.

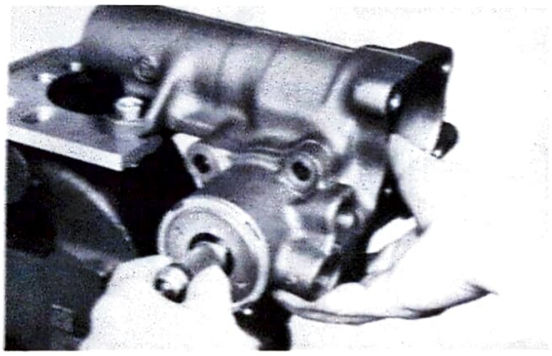
(b) Remove four end cover mounting bolts.

(c) Turn the adjusting screw clockwise until the cover is removed.



3. TAP OUT CROSS SHAFT

Using a plastic hammer, tap on the pitman arm end of the cross shaft and pull out the shaft.



4. REMOVE WORM GEAR VALVE BODY ASSEMBLY

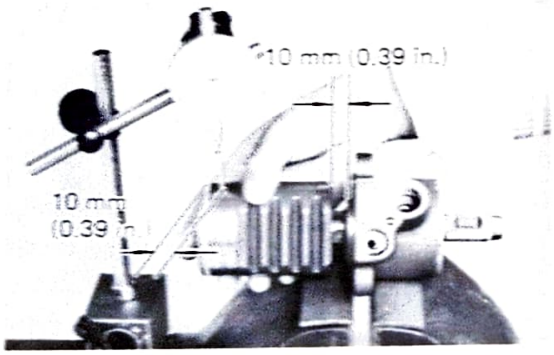
(a) Remove four valve body mounting bolts.

(b) Hold the power piston with your finger and turn the worm shaft clockwise until the valve body O-ring is separated from the housing.

(c) Pull out the worm gear valve body assembly.

CAUTION: Do not allow the worm gear to spin off the shaft.

INSPECTION OF GEAR HOUSING



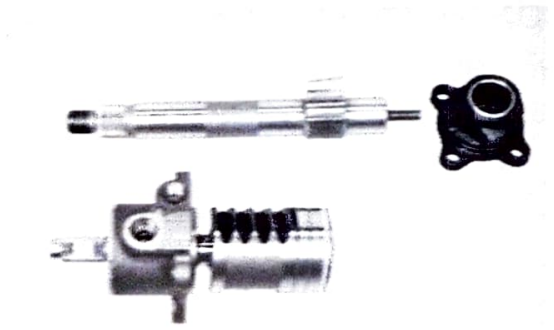
1. CHECK BALL CLEARANCE

(a) Mount the valve body in a vise.

(b) Using a dial indicator, check the ball clearance. Move the worm gear up and down.

Maximum ball clearance: 0.15 mm (0.0059 in.)

If clearance is excessive, the power control valve assembly must be replaced.



2. INSPECT WORM GEAR, SECTOR GEAR, AND END COVER

(a) Inspect both gears for wear or damage.

(b) Inspect bearings for pitmarks or cracks.

(c) Inspect O-ring groove for damage.

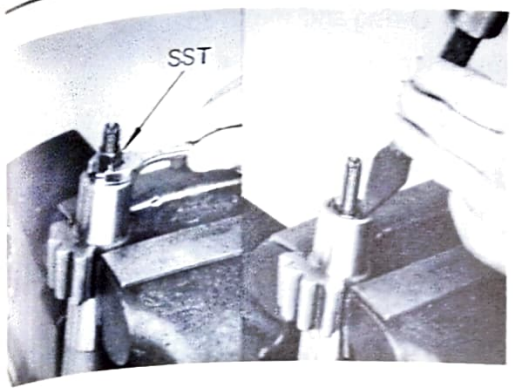
3. CHECK CROSS SHAFT ADJUSTING SCREW END PLAY

(a) Clamp the cross shaft in a vise.

(b) Using a dial indicator, check the end play.

End play: 0.03 – 0.05 mm (0.0012 – 0.0020 in.)

If end play is not correct, see step 4 for adjustment procedure.



4. IF NECESSARY, ADJUST END PLAY

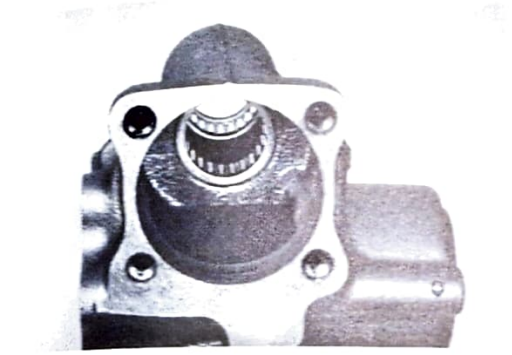
(a) Using a chisel and hammer, remove the lock nut stake.

(b) Using a lock nut tool*, loosen the lock nut.

*SST 09630-00010 or 00002-00800 No.5

(c) Adjust the adjusting screw for correct end play and tighten the lock nut.

(d) Apply caulking to the lock nut.

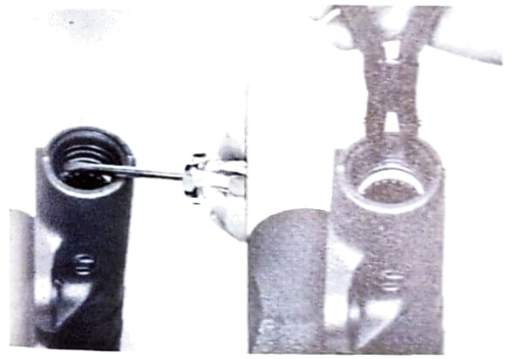


5. INSPECT GEAR HOUSING

(a) Check the needle roller bearings for pitmarks or damage.

(b) Check the teflon ring and O-ring for damage.

Replace bearings as required.

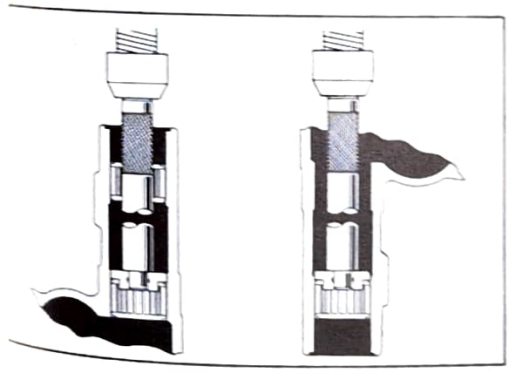


6. REPLACE TEFLON RING AND NEEDLE ROLLER BEARINGS

(a) Pry out the oil seal from the pitman arm end of the housing.

(b) Using snap ring pliers, remove the snap ring.

(c) Remove the metal spacer, teflon seal and O-ring.

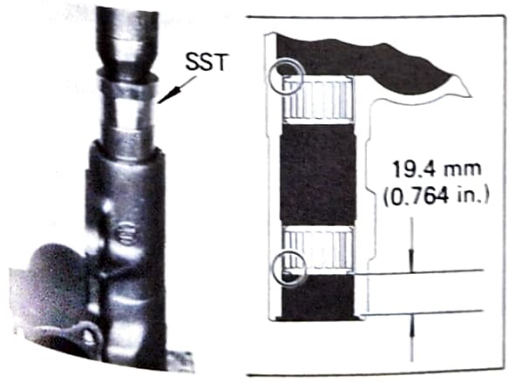


(d) Insert the bearing driver collar* between the two bearings and then the driver handle.*

*SST 09630-00010 or 00002-00800 No. 6 and 7

(e) Press out the bearing.

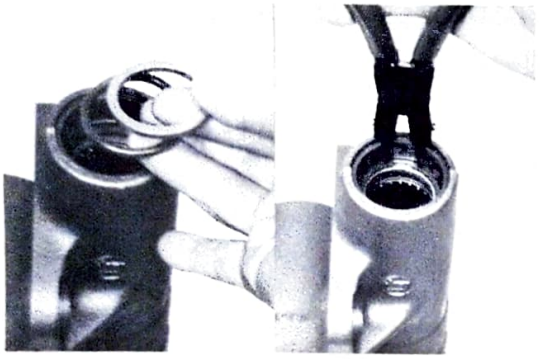
(f) Change sides and press out the other bearing.



(g) Using the bearing driver*, install the top bearing with the long flange out. Drive the bearing in flush with the inside casting surface.

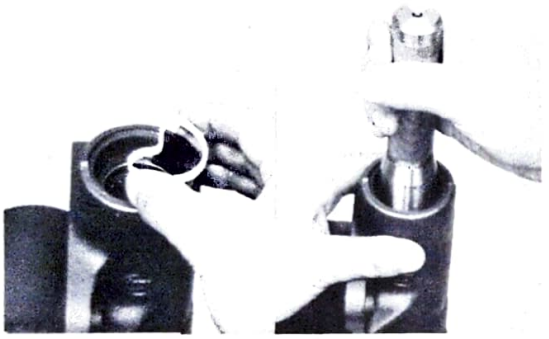
*SST 09630-00010 or 00002-00800 No. 9

(h) Using the same SST, install the lower bearing with the long flange out. The SST will bottom and correctly position the bearing.



(i) Install the rubber O-ring and metal spacer.

(j) Using snap ring pliers, install the snap ring.

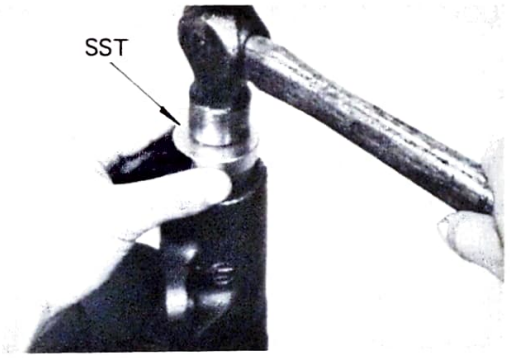


(k) Form the seal into a heart shape and install with your finger.

(l) Using the seal tool*, form the seal.

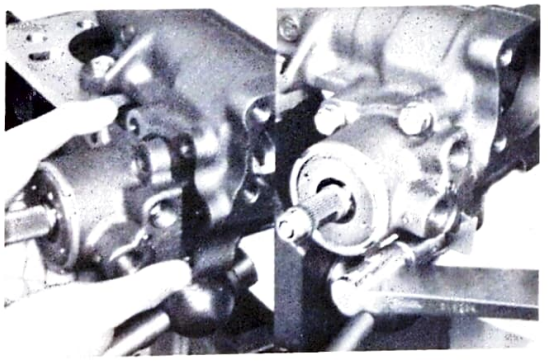
CAUTION: The seal must be formed before inserting the sector shaft or damage will result.

*SST 09630-00010 or 00002-00800



(m) Using a bearing driver*, drive the oil seal into the gear housing.

*SST 09631-60010



ASSEMBLY OF GEAR HOUSING
(See illustration on page 16-61)

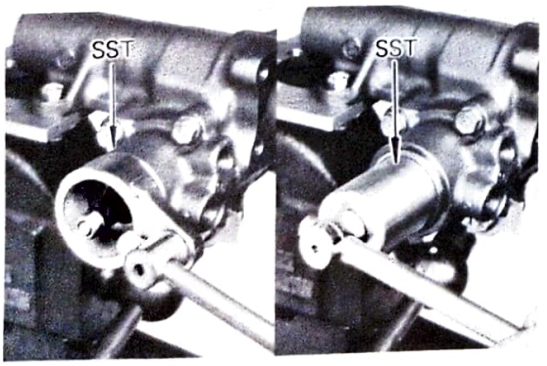
1. INSTALL WORM GEAR VALVE BODY

(a) Install two new O-rings.

(b) Insert the valve body into the housing.

(c) Tighten the valve body mounting bolts in a diagonal pattern.

Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)



2. INSPECT WORM SHAFT BEARING AND REPLACE OIL SEAL

NOTE: If a new worm gear valve body is being installed, skip this procedure.

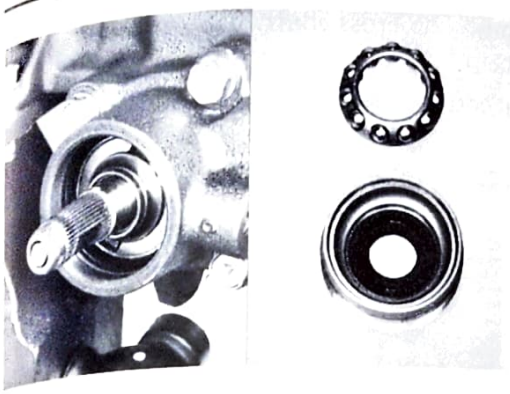
(a) Using the lock nut tool*, remove the lock nut.

*SST 09630-00010 or 00002-00800 No. 3

(b) Using the bearing cap tool*, remove the bearing cap.

*SST 09630-00010 or 00002-00800 No. 4

(c) Remove the worm bearing and O-ring.



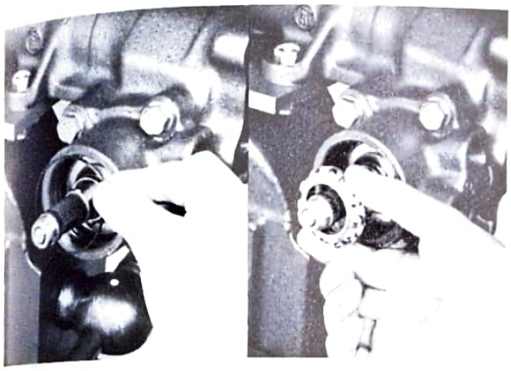
(d) Inspect the bearing and races for pitmarks, cracks or damage.

Replace bearing or cap as required.

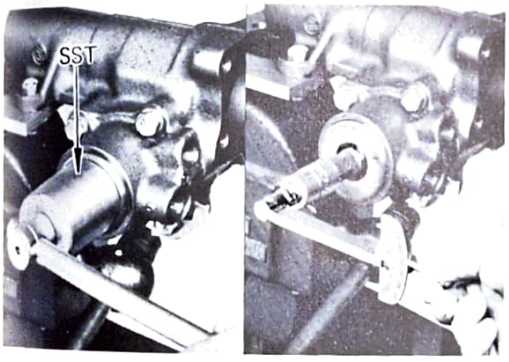
(e) Remove old oil seal.

(f) Using the seal driver*, drive in a new oil seal.

*SST 09630-00010 or 00002-00800 No. 8



(g) Install a new O-ring bearing and bearing cap.



3. ADJUST WORM BEARING PRELOAD

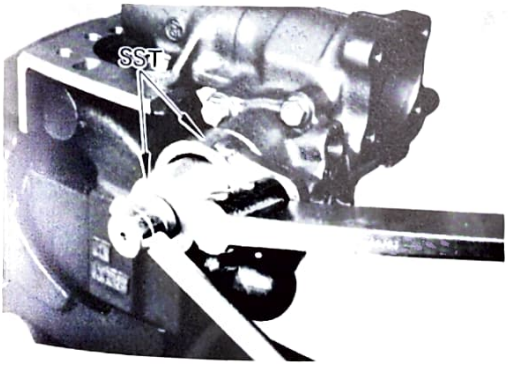
(a) Using the bearing cap tool*, tighten the bearing cap until the preload is correct.

*SST 09630-00010 or 00002-00800 No. 4

(b) Using the worm shaft tool* and torque wrench, check the preload of the bearing.

Preload: 4.0 – 6.5 kg-cm (3.5 – 5.6 in.-lb)

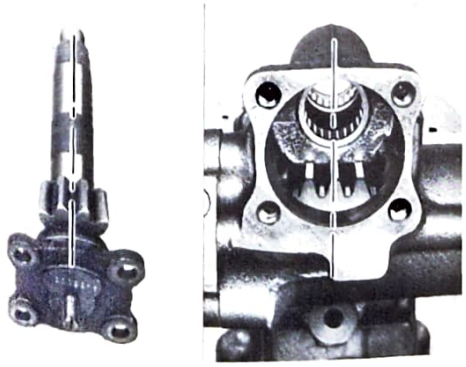
*SST 09616-00010



(c) Using the lock nut tool*, tighten the lock nut while holding the bearing cap with the bearing cap tool*.

Torque: 4.5 – 5.5 kg-m (33 – 39 ft-lb)

*SST 09630-00010 or SST 00002-00800 No. 3 and No. 4



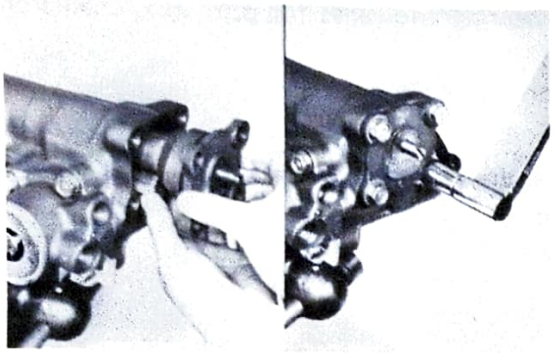
4. INSTALL CROSS SHAFT AND END COVER

(a) Install a new O-ring on the end cover.

(b) Assemble the cross shaft to the end cover.

NOTE: Fully loosen the adjusting screw.

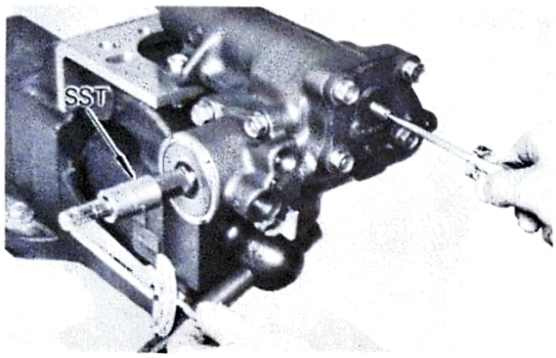
(c) Set the worm gear at the center of the gear housing.



(d) Insert and push the cross shaft into the gear housing so that the center teeth mesh together.

(e) Tighten the end cover mounting bolts in a diagonal pattern.

Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)



5. DETERMINE CENTER POSITION OF GEAR BOX

Turn the worm shaft full lock in both directions and determine the exact center.

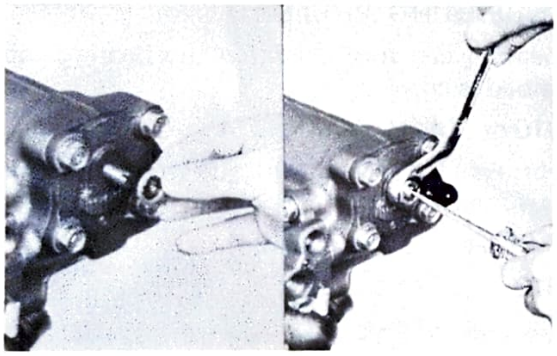
6. ADJUST TOTAL PRELOAD

(a) Install the worm shaft tool* with torque wrench on centered worm shaft.

*SST 09616-00010

(b) Turn the adjusting screw while measuring the preload until the preload is correct.

Total preload: Worm shaft preload plugs
2.0 – 3.0 kg-cm (1.7 – 2.6 in.-lb)

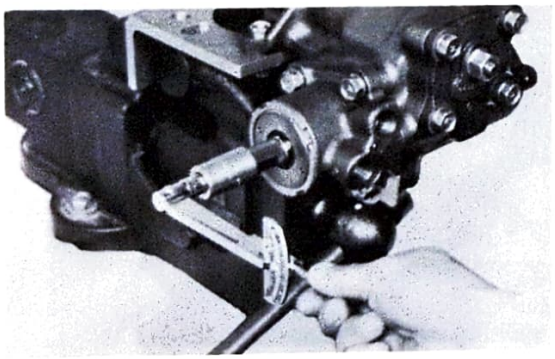


7. INSTALL A NEW WASHER AND TIGHTEN LOCK NUT

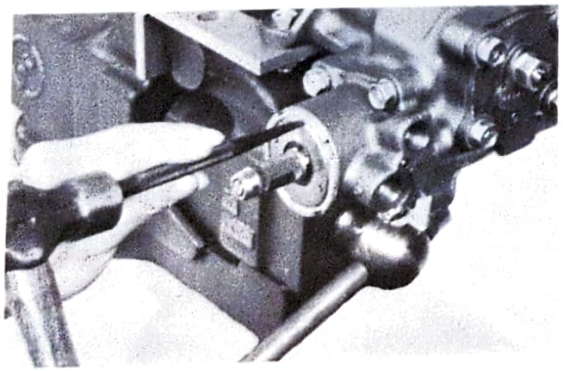
(a) Install a new washer on the adjusting screw.

(b) Tighten the lock nut while holding the adjusting screw.

Torque: 4.0 – 5.5 kg-m (29 – 39 ft-lb)

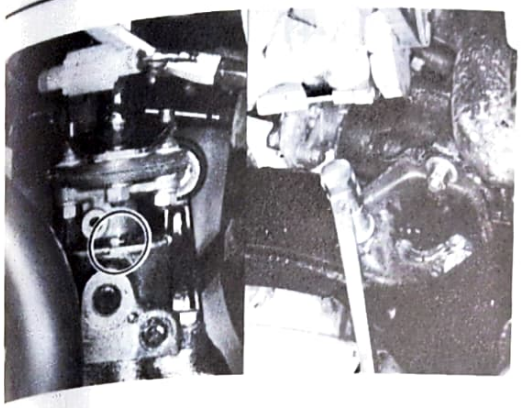


8. RECHECK TOTAL PRELOAD



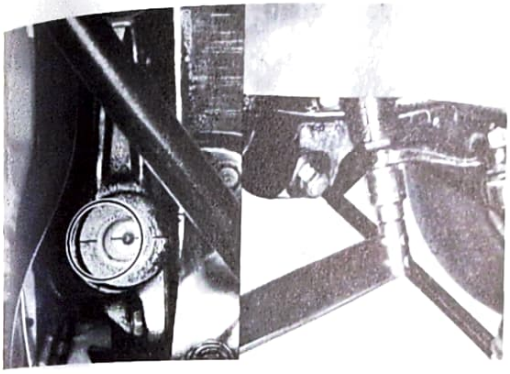
9. STAKE LOCK NUT

Using a punch and hammer, stake the lock nut at three places.

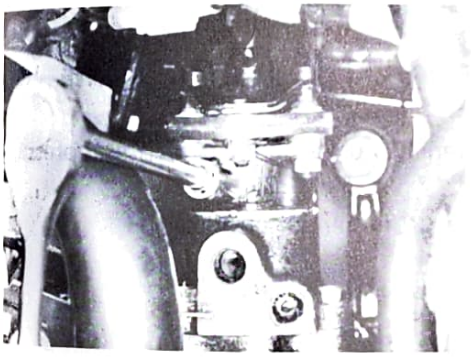


INSTALLATION OF GEAR HOUSING
(See illustration on page 14-60)

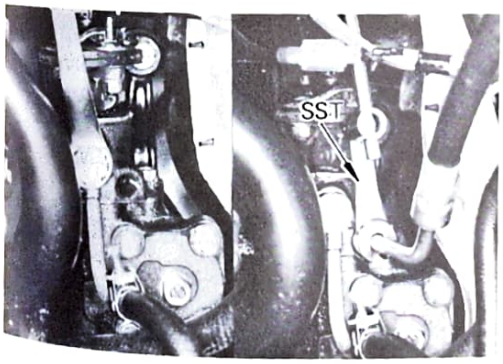
1. INSTALL GEAR HOUSING
   (a) Align marks on worm shaft and coupling.
   (b) Tighten the gear housing mounting bolts.
   Torque: 5.0 – 6.0 kg-m (37 – 43 ft-lb)



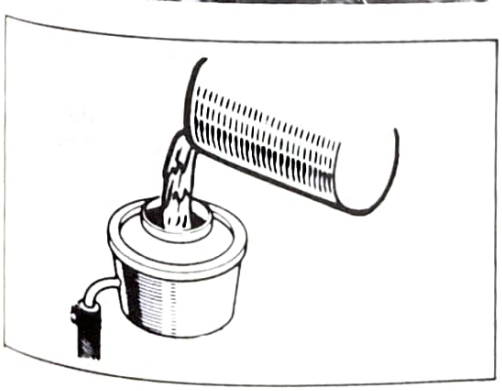
2. CONNECT PITMAN ARM
   (a) Align marks on the pitman arm and cross shaft.
   (b) Tighten the pitman arm nut.
   Torque: 11.0 – 12.5 kg-m (80 – 90 ft-lb)



3. TIGHTEN COUPLING BOLT
   Torque the coupling bolt.
   Torque: 2.0 – 3.0 kg-m (15 – 21 ft-lb)



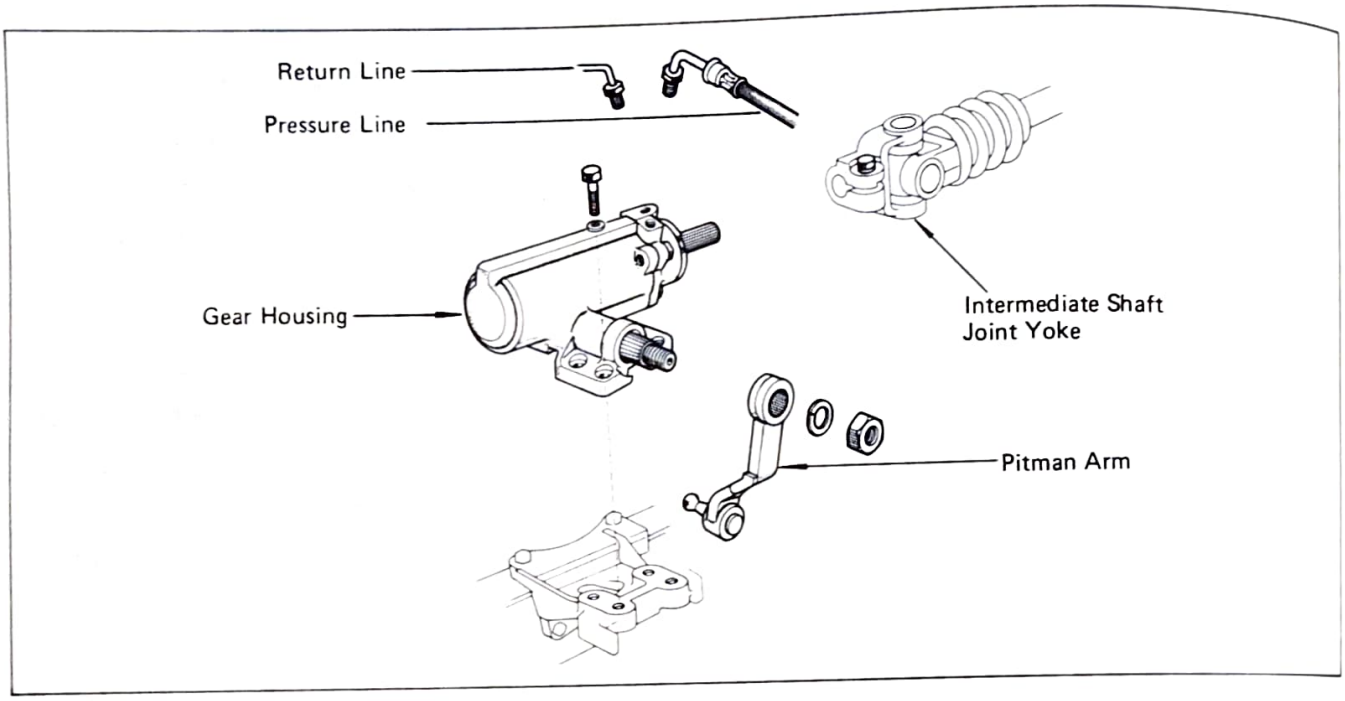
4. INSTALL PRESSURE AND RETURN LINES
   (a) Connect the return line and tighten the union bolt.
   Return line torque: 4.5 – 5.5 kg-m (32 – 39 ft-lb)
   (b) Using a flare nut wrench*, connect the pressure line.
   *SST 09631-22020 or Commercial wrench
   Pressure line torque: 4.0 – 5.0 kg-m (29 – 36 ft-lb)
   NOTE: Be sure the hose is not touching the fender.



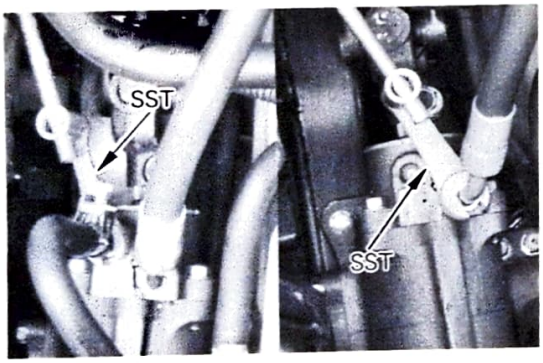
5. FILL RESERVOIR WITH FLUID
   Fluid: ATF type Dexron

6. BLEED SYSTEM AND PERFORM PRESSURE CHECK **(See page 16-49)**

Gear Housing (RN 4x4)



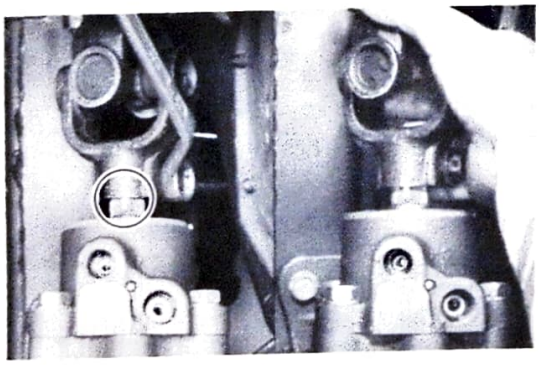
REMOVAL OF GEAR HOUSING



1. DISCONNECT RETURN LINE AND PRESSURE LINE

Using a flare nut wrench*, disconnect return and pressure lines.

*SST 09631-22020 or Commercial wrench

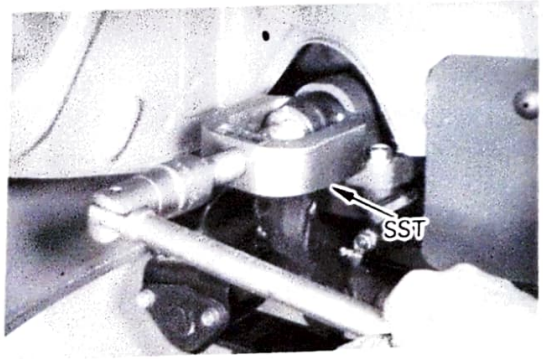


2. MARK JOINT YOKE AND WORM SHAFT

Place an alignment mark on the joint yoke and worm shaft to ensure correct reassembly.

3. DISCONNECT INTERMEDIATE SHAFT FROM WORM SHAFT

Loosen the joint yoke bolt and compress the intermediate shaft.



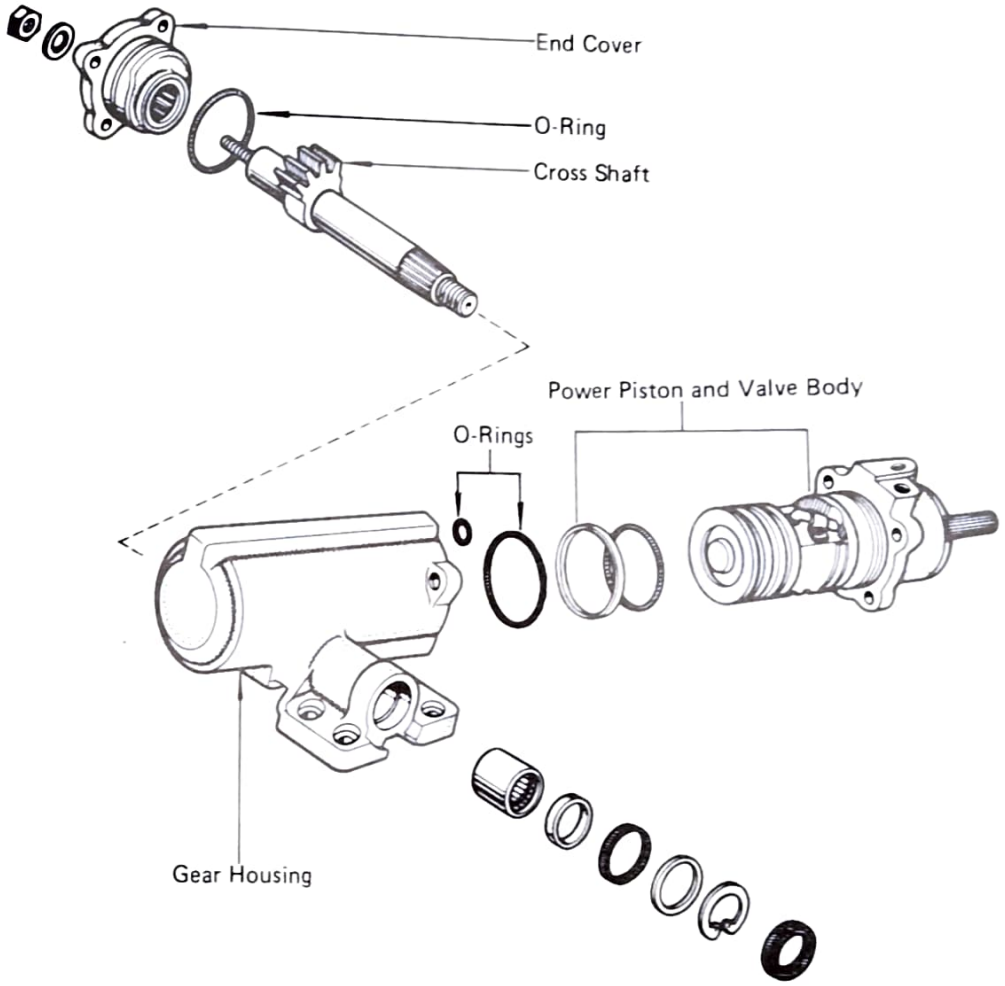
4. DISCONNECT PITMAN ARM FROM GEAR HOUSING

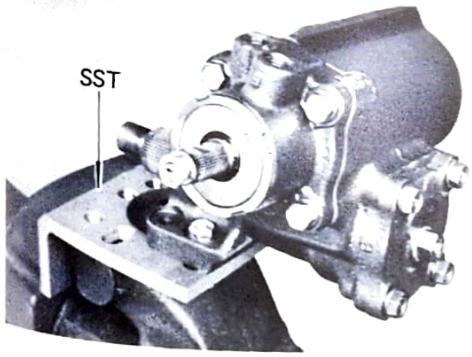
Remove the pitman arm set nut. Using a pitman arm puller*, disconnect the pitman arm from the gear housing.

*SST 09610-55012

5. REMOVE GEAR HOUSING

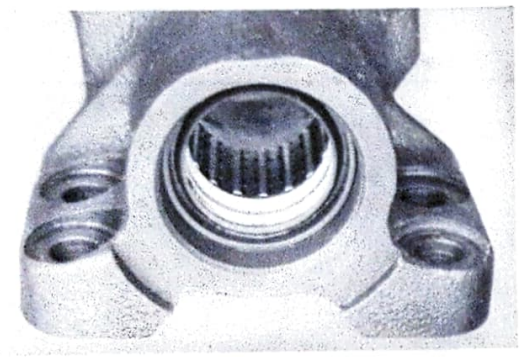
Remove four bolts and take out the gear housing out of the engine compartment side.





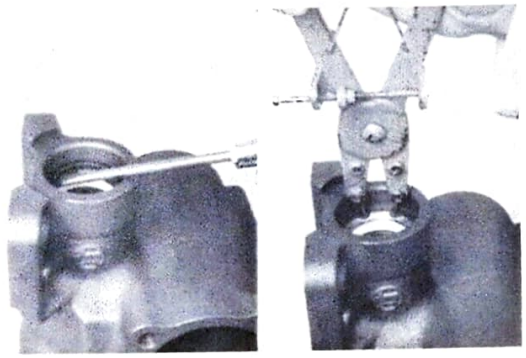
DISASSEMBLY OF GEAR HOUSING

NOTE: Disassembly procedure is same as for RN 4x2. Refer to DISASSEMBLY OF GEAR HOUSING RN 4x2 on page 16-61.



INSPECTION OF GEAR HOUSING

NOTE: Inspection procedure is same as for RN 4x2 except REPLACEMENT OF TEFLON RING AND NEEDLE ROLLER BEARING. Refer to INSPECTION OF GEAR HOUSING RN 4x2 on page 16-62.

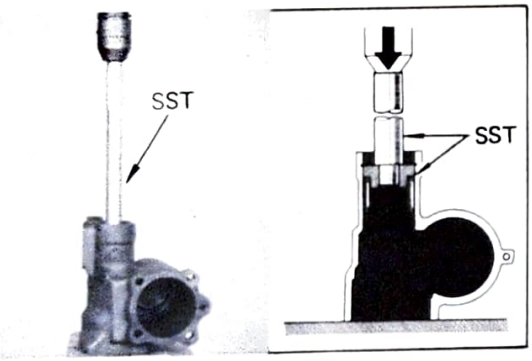


REPLACE TEFLON RING AND NEEDLE ROLLER BEARING

(a) Pry out the oil seal from the pitman arm end of the housing.

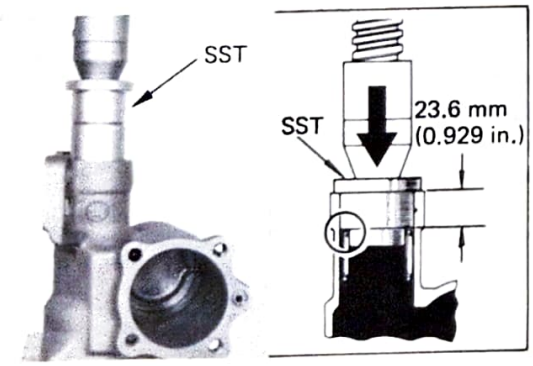
(b) Using snap ring pliers, remove the snap ring.

(c) Remove the metal spacer, teflon seal and O-ring.



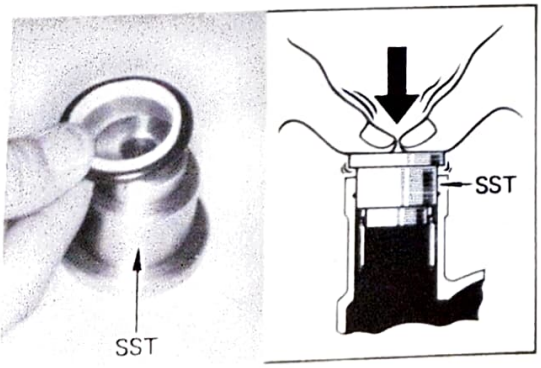
(d) Using a bearing driver*, drive out the bearing.

*SST 09630-00010



(e) Using a bearing driver*, install the new bearing with the long flange nut.
The SST will bottom and correctly position the bearing.

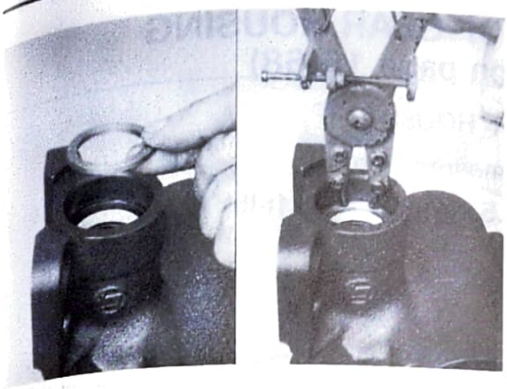
*SST 09631-60010



(f) Install the new teflon ring together with the new O-ring to SST*.

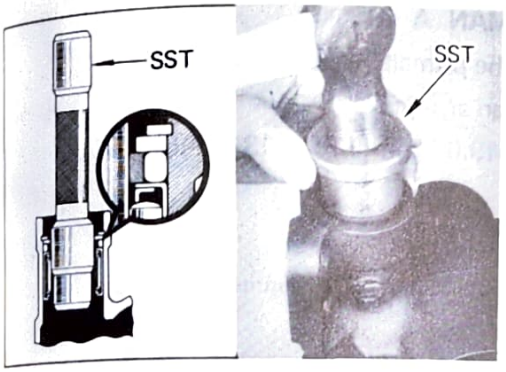
*SST 09631-60010

(g) Install the teflon ring and O-ring to the gear housing with the SST.



(h) Install the metal spacer.

(i) Using snap ring pliers, install the snap ring.



(j) Using the seal tool*, form the seal.

CAUTION: The seal must be formed before inserting the sector shaft or damage will result.

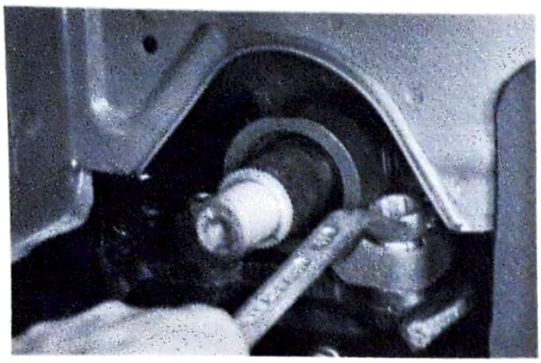
*SST 09630-00010 or 00002-00800

(k) Using a bearing driver*, drive the oil seal into the gear housing.

*SST 09631-60010

ASSEMBLY OF GEAR HOUSING
(See illustration on page 16-69)

NOTE: Assembly procedure is same as for RN 4x2. Refer to ASSEMBLY OF GEAR HOUSING RN 4x2 on page 16-64.

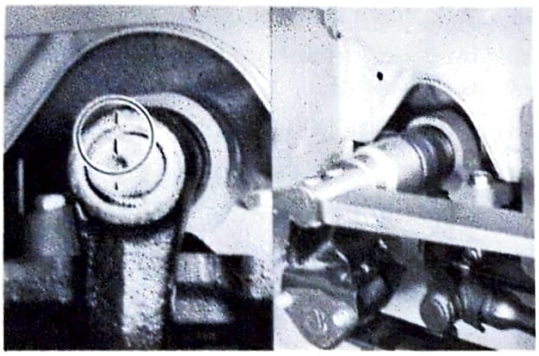


INSTALLATION OF GEAR HOUSING
(See illustration on page 16-68)

1. INSTALL GEAR HOUSING

Torque the four mounting bolts.

Torque: 5.0 – 6.5 kg-m (37 – 47 ft-lb)

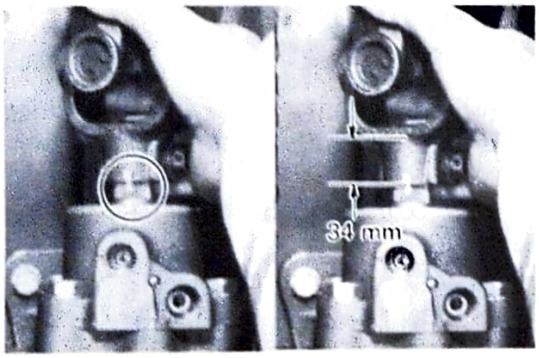


2. CONNECT PITMAN ARM

Align marks on the pitman arm and cross shaft.

Torque the pitman arm nut.

Torque: 16.0 – 19.0 kg-m (116 – 137 ft-lb)



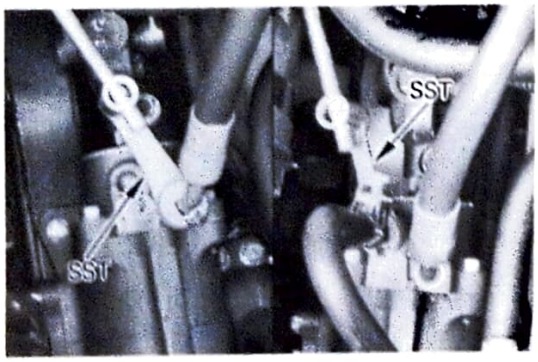
3. CONNECT INTERMEDIATE SHAFT TO WORM SHAFT

(a) Align the alignment marks on the joint yoke and worm shaft.

(b) Compress and install the intermediate shaft onto the worm shaft to a depth of 34 mm (1.34 in.).

(c) Tighten the joint yoke bolt.

Torque: 3.0 – 4.5 kg-mm (22 – 32 ft-lb)



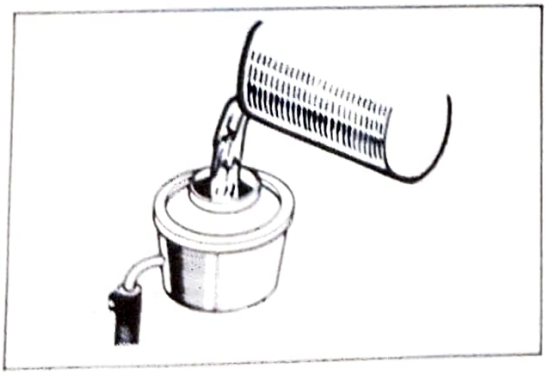
4. INSTALL PRESSURE AND RETURN LINES

Using a flare nut wrench*, install and tighten the union nuts.

*SST 09631-22020 or Commercial wrench

Torque: 4.0 – 5.0 kg-m (29 – 36 ft-lb)

NOTE: Be sure the hose is not touching the fender.

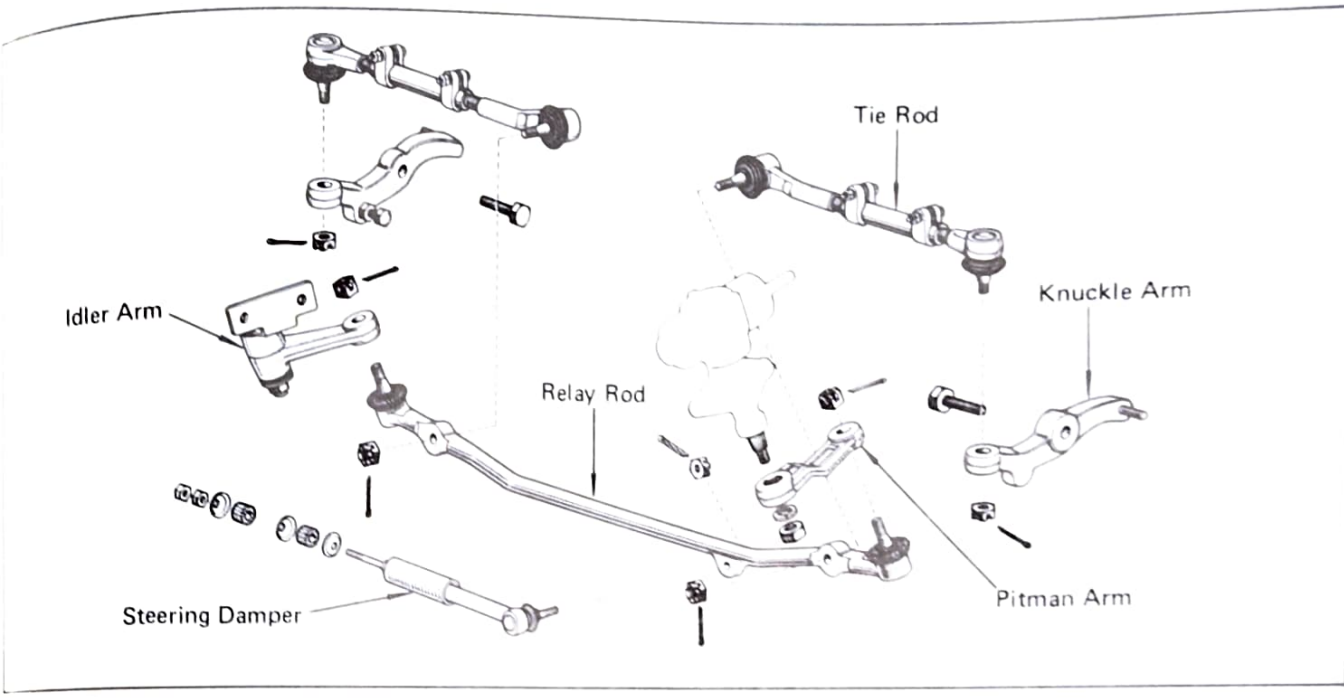


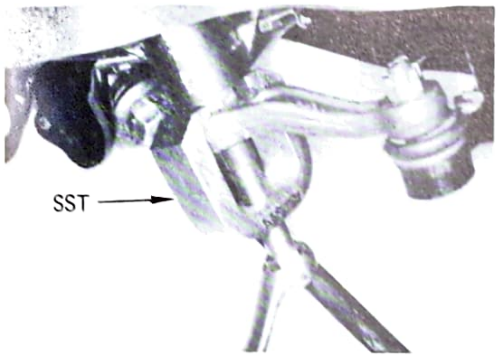
5. FILL RESERVOIR WITH FLUID

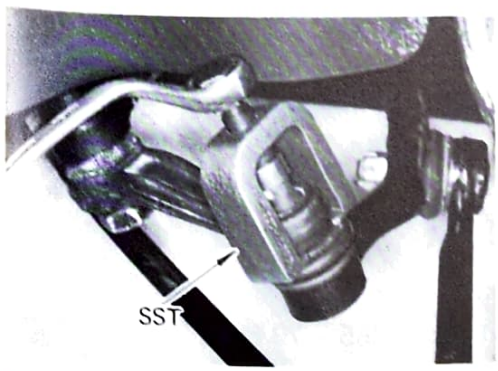
Fluid: ATF type Dexron

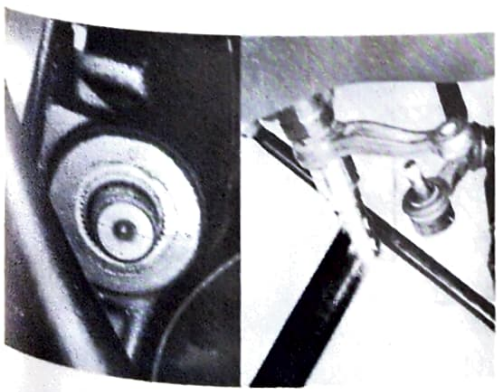
6. BLEED SYSTEM AND PERFORM PRESSURE CHECK (See page 16-49)

STEERING LINKAGE (RN 4x2)









NOTE: After installing any of the steering linkage components, check the front wheel alignment and side slip. (See page 13-3)

Pitman Arm

REMOVAL AND INSPECTION OF PITMAN ARM

1. DISCONNECT PITMAN ARM FROM SECTOR SHAFT

   Using pitman arm puller*, disconnect the pitman arm from the sector shaft.

   *SST 09610-55012

2. DISCONNECT PITMAN ARM FROM TIE ROD

   Using tie rod end puller*, disconnect the pitman arm from the relay rod.

   *SST 09611-20014

3. INSPECT ARM FOR WEAR, DAMAGE OR CRACKS

   Check for cracks with flaw detecting penetrant.

INSTALLATION OF PITMAN ARM

CONNECT PITMAN ARM TO TIE ROD AND SECTOR SHAFT

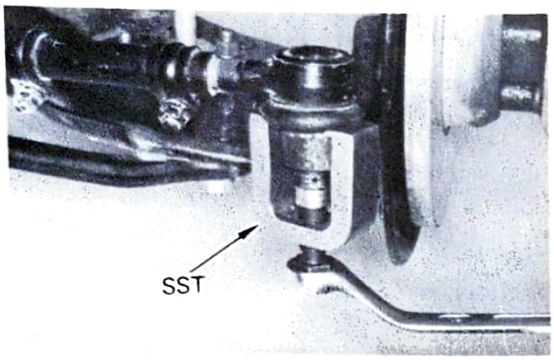
(a) Align marks on the pitman arm and the sector shaft.

(b) Torque the pitman arm nut.

Torque: 11.0 – 12.5 kg-m (80 – 90 ft-lb)

(c) Torque the relay rod nut.

Torque: 7.5 – 11.0 kg-m (55 – 79 ft-lb)



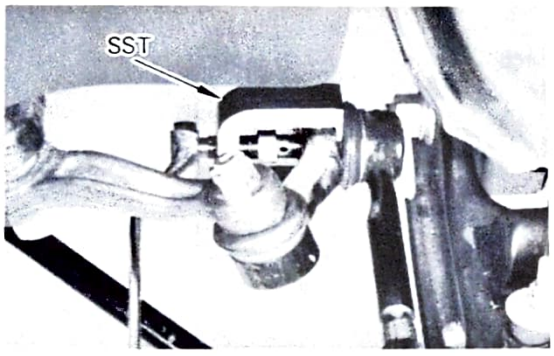
Tie Rod

REMOVAL AND INSPECTION OF TIE ROD (See illustration on page 16-73)

1. **DISCONNECT TIE ROD FROM RELAY ROD AND KNUCKLE ARM**

   Using tie rod end puller*, disconnect the tie rod.

   *SST 09611-22011



2. **INSPECT TIE ROD FOR WEAR, DAMAGE OR CRACKS**

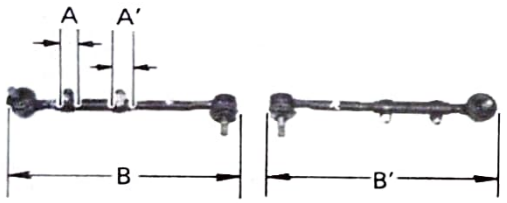
   Check for cracks with flaw detecting penetrant.

INSTALLATION OF TIE ROD

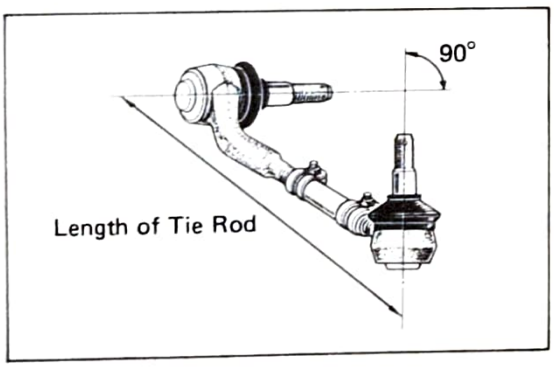
1. **ASSEMBLE AND ADJUST TIE RODS TO SAME LENGTH**

   Turn the tie rods in the adjusting clamp until measurements are equal as shown. Tie rods should be approximately 314 mm (12.36 in.).

A = A'



B = B'



2. **ADJUST TIE ROD END ANGLE**

   (a) Turn tie rods so they cross at about 90 degrees.

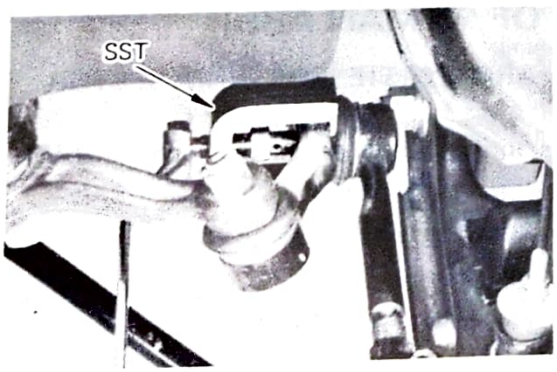
   (b) Tighten the adjusting tube clamps to lock the tie rods in position.

   Torque: 2.0 — 3.0 kg-m (15 — 21 ft-lb)

3. **CONNECT TIE ROD**

   Torque the mounting bolts.

   Torque: 7.5 — 11.0 kg-m (55 — 79 ft-lb)



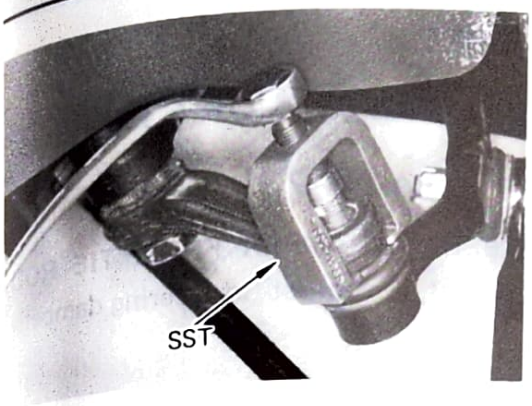
Relay Rod

REMOVAL AND INSPECTION OF RELAY ROD (See illustration on page 16-73)

1. **DISCONNECT TIE ROD ENDS FROM RELAY ROD**

   Using the tie rod end puller*, disconnect the tie rod ends from the relay rod.

   *SST 09611-22011



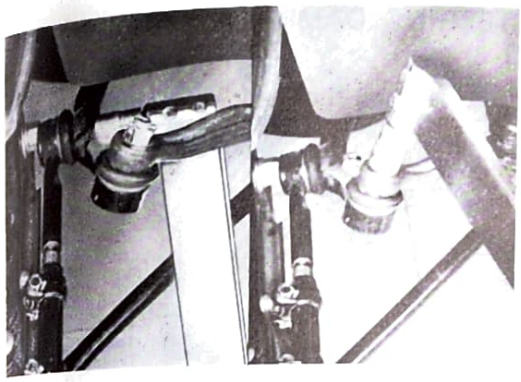
2. DISCONNECT RELAY ROD FROM PITMAN ARM AND IDLER ARM

Using puller*, disconnect and remove the relay rod.

*SST 09611-20014

3. INSPECT RELAY ROD FOR WEAR, DAMAGE OR CRACKS

Check for cracks with flaw detecting penetrant.



INSTALLATION OF RELAY ROD

CONNECT RELAY ROD TO FOLLOWING PARTS

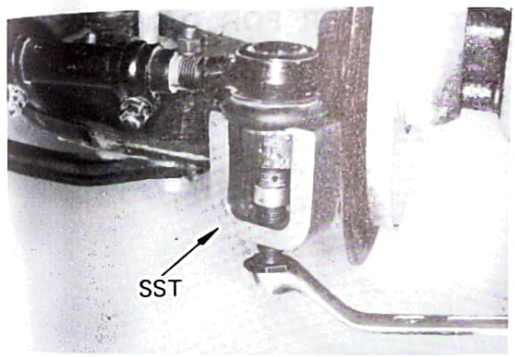
(a) Idler arm

(b) Pitman arm

(c) Tie rods

Torque four nuts.

Torque:	Idler arm side	5.0 – 7.0 kg-m (37 – 50 ft-lb)
	Pitman arm side	7.5 – 11.0 kg-m (55 – 79 ft-lb)



Knuckle Arm

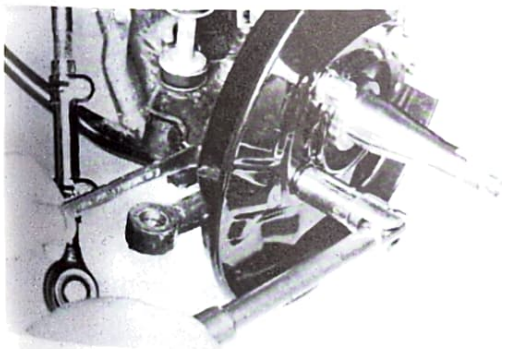
REMOVAL AND INSPECTION OF KNUCKLE ARM

(See illustration on page 16-73)

1. DISCONNECT TIE ROD FROM KNUCKLE ARM

Using the rod end puller*, disconnect the tie rod from the knuckle arm.

*SST 09611-22011



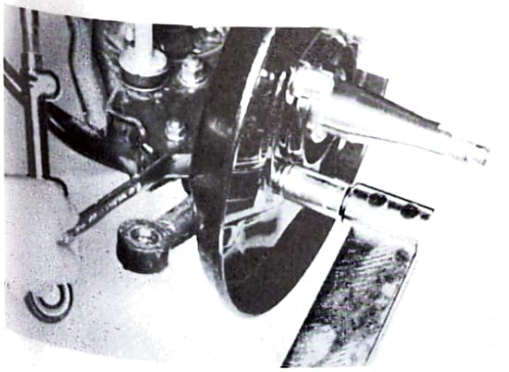
2. REMOVE FRONT AXLE HUB

(See page 13-7)

3. REMOVE KNUCKLE ARM

4. INSPECT KNUCKLE ARM FOR WEAR, DAMAGE OR CRACKS

Check for cracks with flaw detecting penetrant.



INSTALLATION OF KNUCKLE ARM

1. INSTALL KNUCKLE ARM TO STEERING KNUCKLE

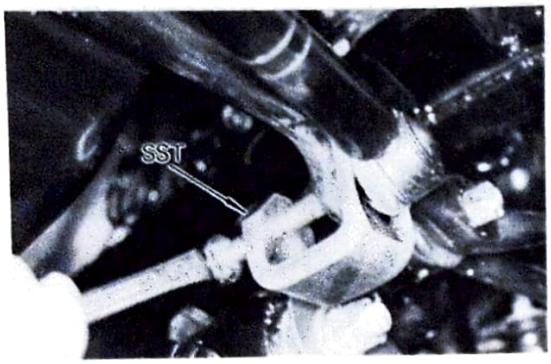
Torque: 9.0 – 13.0 kg-m (66 – 94 ft-lb)

2. INSTALL FRONT AXLE HUB (See page 13-8)

3. CONNECT TIE ROD TO KNUCKLE ARM

Torque the bolt.

Torque: 7.5 – 11.0 kg-m (55 – 79 ft-lb)



Steering Damper

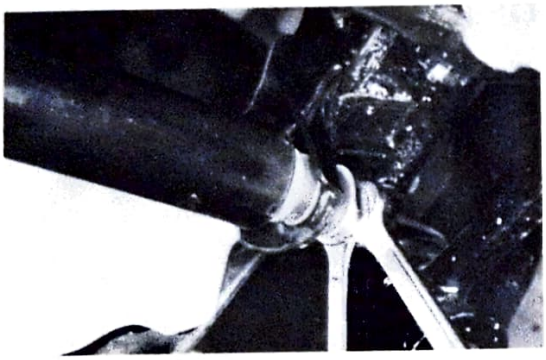
REMOVAL AND INSPECTION OF STEERING DAMPER

(See illustration on page 16-73)

1. DISCONNECT STEERING DAMPER FROM TIE ROD

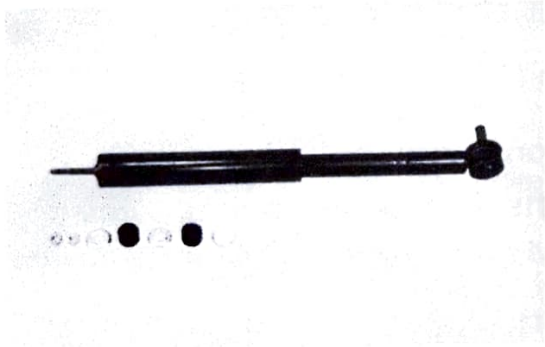
   Using tie rod end puller*, disconnect the steering damper.

   *SST 09611-12010

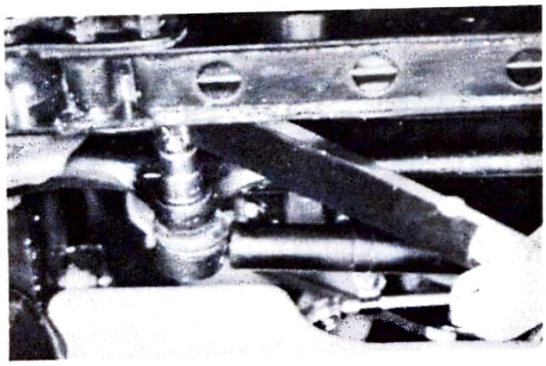


2. DISCONNECT STEERING DAMPER FROM FRONT AXLE HOUSING

   Using two wrenches, remove the lock nut and mounting nut.



3. INSPECT STEERING DAMPER FOR DAMAGE AND OIL LEAKAGE



INSTALLATION OF STEERING DAMPER

1. CONNECT STEERING DAMPER TO TIE ROD

   Torque the mounting nut.

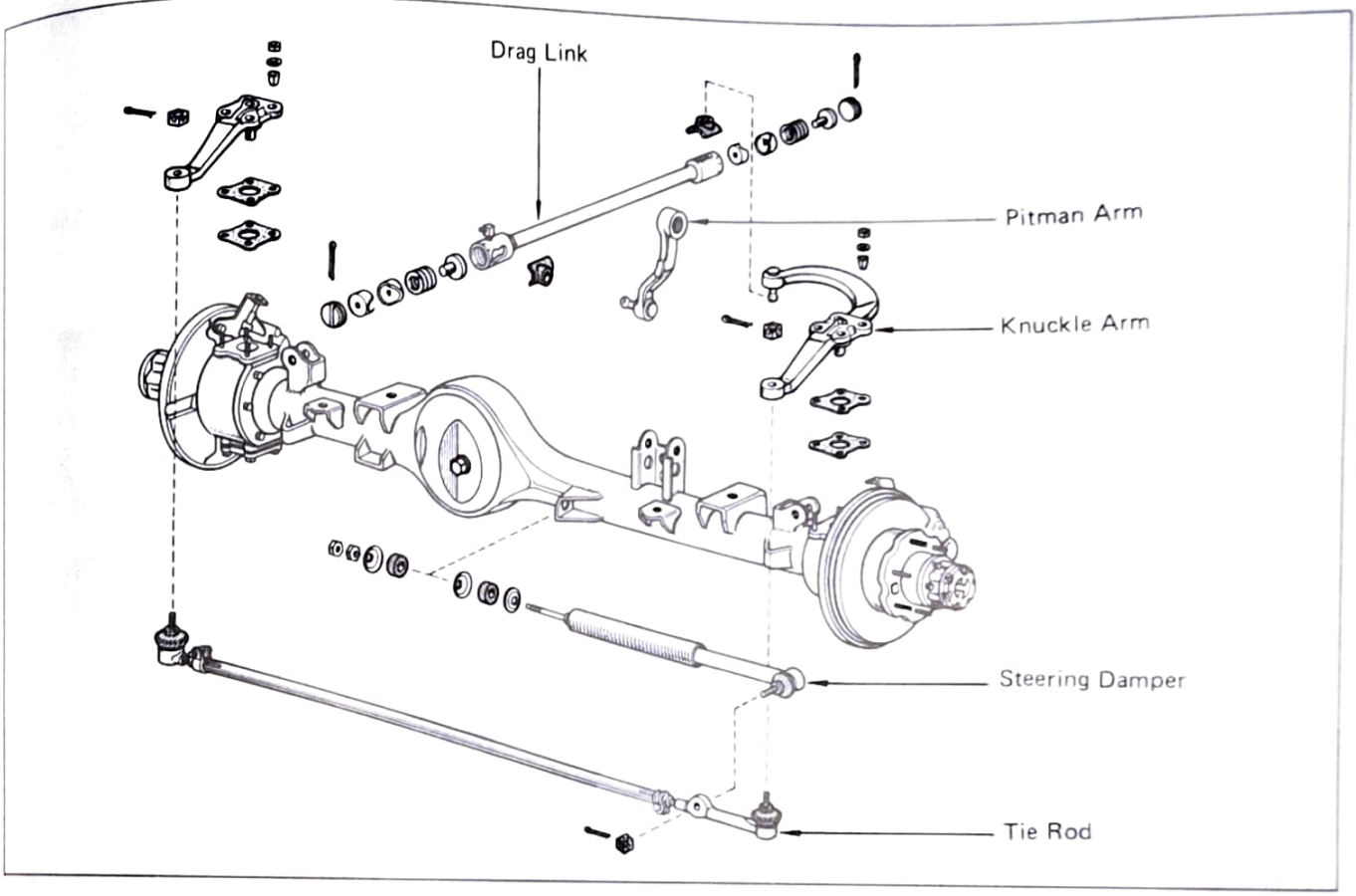
   Torque: 5.0 — 7.0 kg-m (37 — 50 ft-lb)

2. CONNECT STEERING DAMPER TO FRON AXLE HOUSING

   Install the cushions and washers, and torque the mounting nut and lock nut.

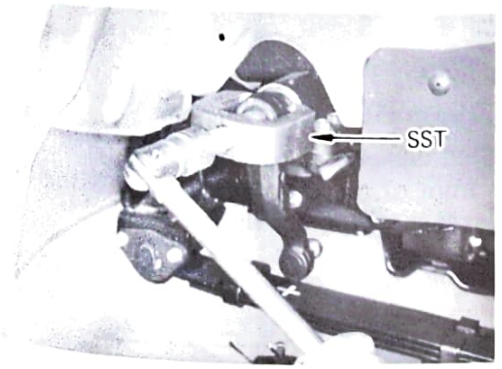
   Torque: 1.0 — 1.6 kg-m (8 — 11 ft-lb)

STEERING LINKAGE (RN 4x4)



Pitman Arm

REMOVAL AND INSPECTION OF PITMAN ARM



1. DISCONNECT PITMAN ARM FROM DRAG LINK
(See page 16-79)

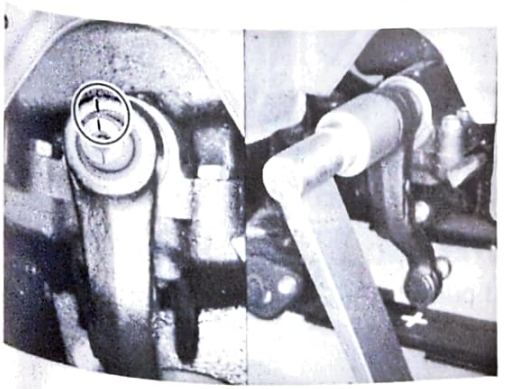
2. DISCONNECT PITMAN ARM FROM SECTOR SHAFT

Using pitman arm puller*, disconnect the pitman arm from the sector shaft.

*SST 09610-55012

3. INSPECT ARM FOR WEAR, DAMAGE OR CRACKS

Check for cracks with flaw detecting penetrant.



INSTALLATION OF PITMAN ARM

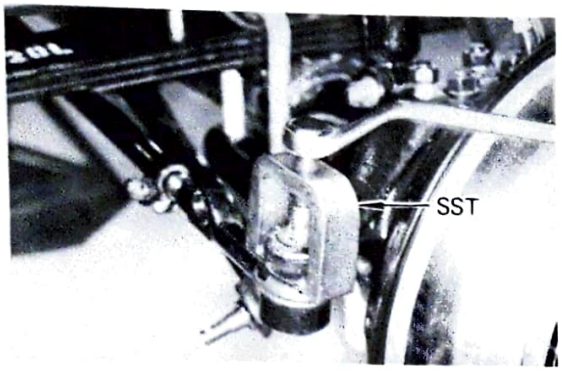
1. CONNECT PITMAN ARM TO SECTOR SHAFT

(a) Align marks on the pitman arm and the sector shaft.

(b) Torque the pitman arm bolt.

Torque: 16.0 – 19.0 kg-m (116 – 137 ft-lb)

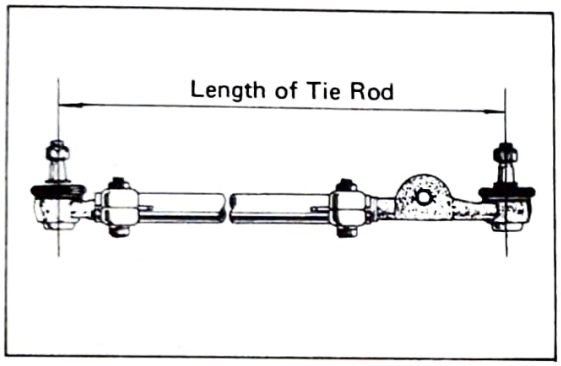
2. CONNECT PITMAN ARM TO DRAG LINK
(See page 16-79)



Tie Rod

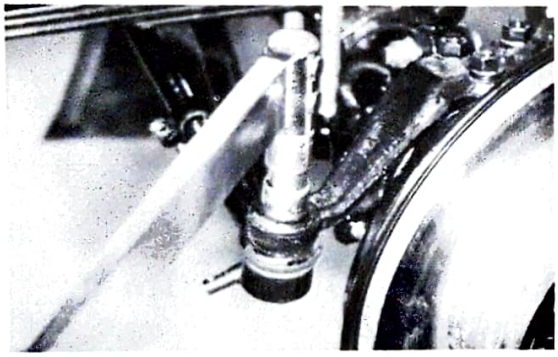
REMOVAL AND INSPECTION OF TIE ROD (See illustration on page 16-77)

1. DISCONNECT STEERING DAMPER FROM TIE ROD (See page 16-78)
2. DISCONNECT TIE ROD FROM KNUCKLE ARM
   Using tie rod end puller*, disconnect the tie rod.
   *SST 09611-22011
3. INSPECT TIE ROD FOR WEAR, DAMAGE OR CRACKS
   Check for cracks with flaw detecting penetrant.

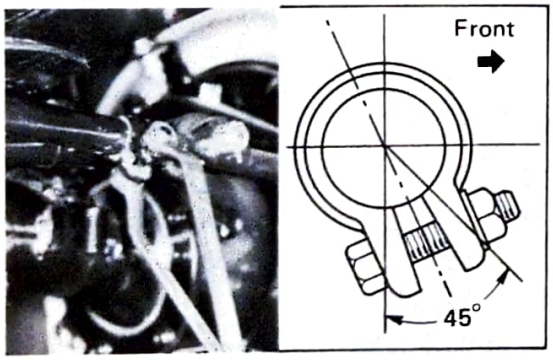


INSTALLATION OF TIE ROD

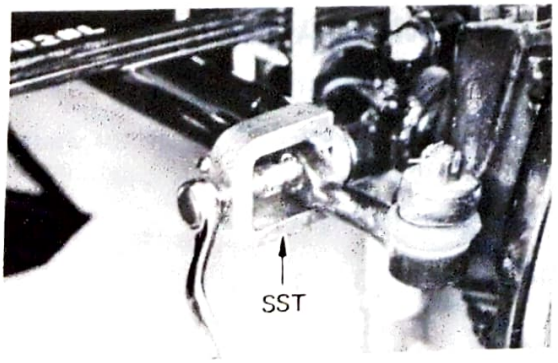
1. ASSEMBLE AND ADJUST TIE ROD TO SPECIFIED LENGTH
   Turn the tie rod ends equal amounts into the tie rod tube. Tie rods should be approximately 120 cm (47.24 in.).



2. CONNECT TIE ROD
   Torque the mounting bolts.
   Torque: 7.5 — 11.0 kg-m (55 — 79 ft-lb)
3. CONNECT STEERING DAMPER (See page 16-79)
4. ADJUST TOE-IN (See page 13-29)



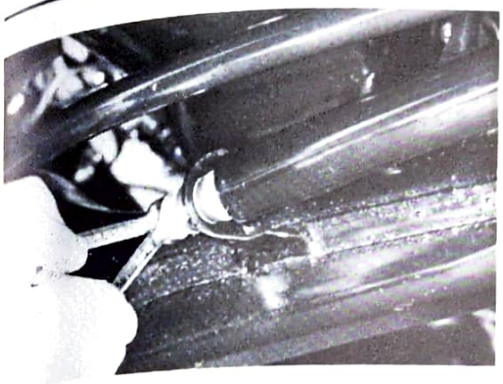
5. TIGHTEN CLAMP BOLTS
   Torque the clamp bolts.
   Torque: 2.0 — 3.0 kg-m (15 — 21 ft-lb)
   NOTE: The steering damper side clamp opening must be positioned at the front of the tie rod and face within 45° from straight down as shown in the figure.



Steering Damper

REMOVAL AND INSPECTION OF STEERING DAMPER (See illustration on page 16-77)

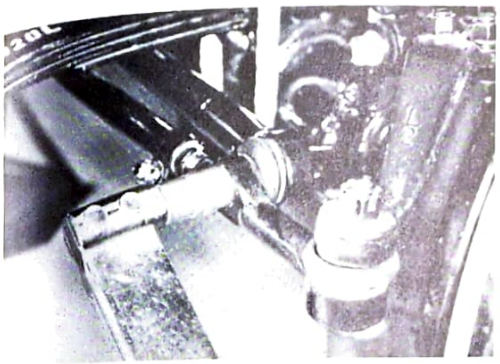
1. DISCONNECT STEERING DAMPER FROM TIE ROD
   Using tie rod end puller*, disconnect the steering damper.
   *SST 09611-22011



2. DISCONNECT STEERING DAMPER FROM FRONT AXLE HOUSING

Using two wrenches, remove the lock nut and mounting nut.

3. INSPECT STEERING DAMPER FOR DAMAGE AND OIL LEAKAGE



INSTALLATION OF STEERING DAMPER

1. CONNECT STEERING DAMPER TO TIE ROD

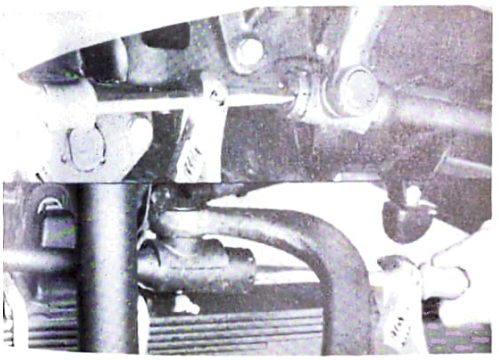
Torque the mounting nut.

Torque: 5.0 – 7.0 kg-m (37 – 50 ft-lb)

2. CONNECT STEERING DAMPER TO FRON AXLE HOUSING

Install the cushions and washers, and torque the mounting nut and lock nut.

Torque: 1.0 – 1.6 kg-m (8 – 11 ft-lb)



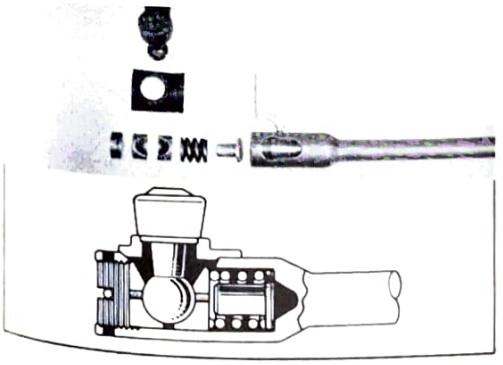
Drag Link

REMOVAL AND INSPECTION OF DRAG LINK

(See illustration on page 16-77)

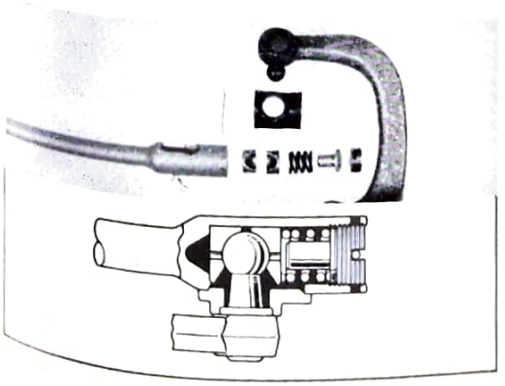
1. DISCONNECT DRAG LINK FROM PITMAN ARM AND KNUCKLE ARM
   (a) Remove two cotter pins and plugs with a screwdriver on both sides.
   (b) Remove the drag link.

2. INSPECT PARTS FOR WEAR OR DAMAGE



INSTALLATION OF DRAG LINK

1. CONNECT DRAG LINK TO PITMAN ARM
   (a) Install the pitman arm side as shown in the figure.
   (b) Tighten the plug completely and then loosen 1-1/3 turns.



2. CONNECT DRAG LINK TO KNUCKLE ARM
   (a) Install the knuckle arm side as shown in the figure.
   (b) Tighten the plug completely and then loosen 1-1/3 turns.

3. APPLY CHASSIS GREASE TO BOTH NIPPLES

Knuckle Arm

(See page 13-40)

BODY ELECTRICAL SYSTEM

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PRECAUTION

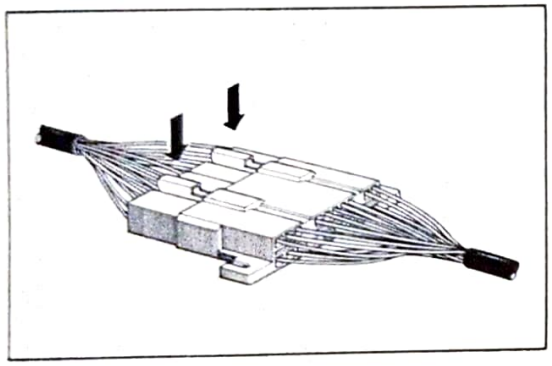
Wiring Color

WIRING COLOR CODE

Wire colors are indicated by an alphabetical code. The 1st letter indicates the basic wire color and the 2nd indicates the stripe color.

B = Black	Br = Brown
G = Green	Gr = Grey
L = Light Blue	Lg = Light Green
O = Orange	P = Pink
R = Red	V = Violet
W = White	Y = Yellow

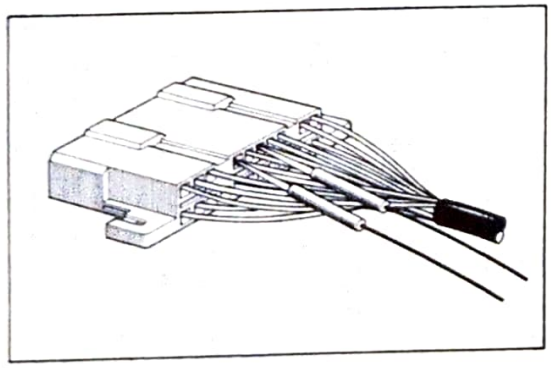
Example: RG indicates a Red wire with a Green stripe



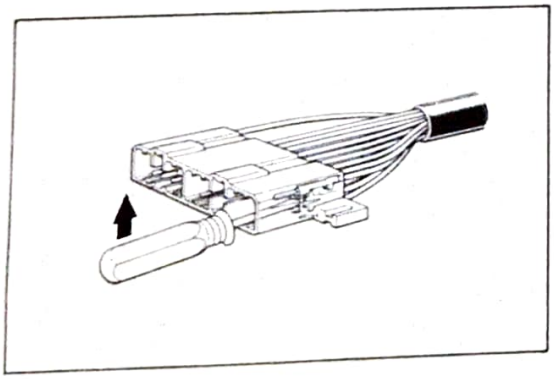
Bulkhead Type Connector

BULKHEAD TYPE CONNECTOR HANDLING AND INSPECTION

1. To remove the connector, push the lock levers, as shown in the figure and pull out.



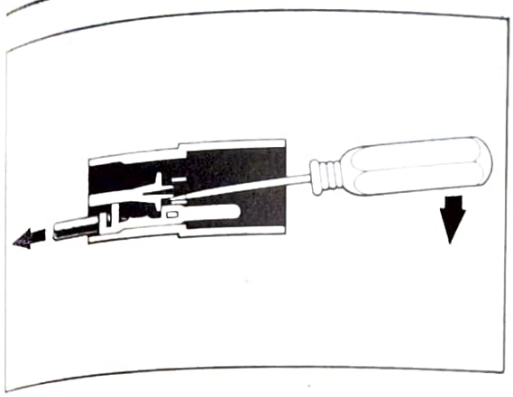
2. When checking the continuity or voltage with a circuit tester, insertion of the test probe into the receptacle connector may open the fitting to the connector and result in poor contact.
   Therefore, ensure that the test probe is inserted only from the wire harness side as shown in figure.



Replacement of Terminal

1. REMOVE TERMINAL

   (a) From the open end, insert a miniature screwdriver between the locking lugs and terminal.



(b) Pry up the locking lugs with the screwdriver and pull the terminal out from the rear.

2. INSTALL TERMINAL

(a) Using a screwdriver, raise both lugs on the terminal.

(b) Push the terminal into the connector as shown.

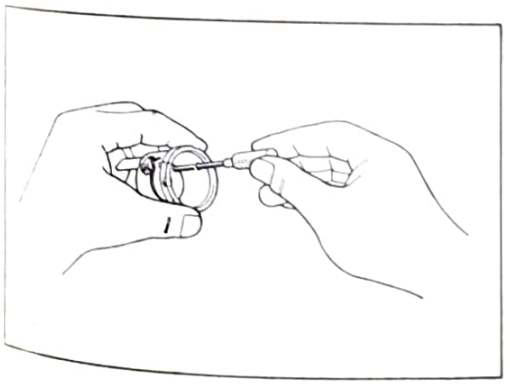
Circuit Breaker

Reset of Circuit Breaker

1. REMOVE CIRCUIT BREAKER

(a) Remove circuit breaker assembly.

(b) Unlock the stopper and pull out the circuit breaker.



2. RESET CIRCUIT BREAKER

(a) Insert the needle into the reset hole and push it.

(b) Using an ohmmeter, check that there is a continuity between both terminals of the circuit breaker.

If no continuity, replace the circuit breaker.

3. INSTALL CIRCUIT BREAKER

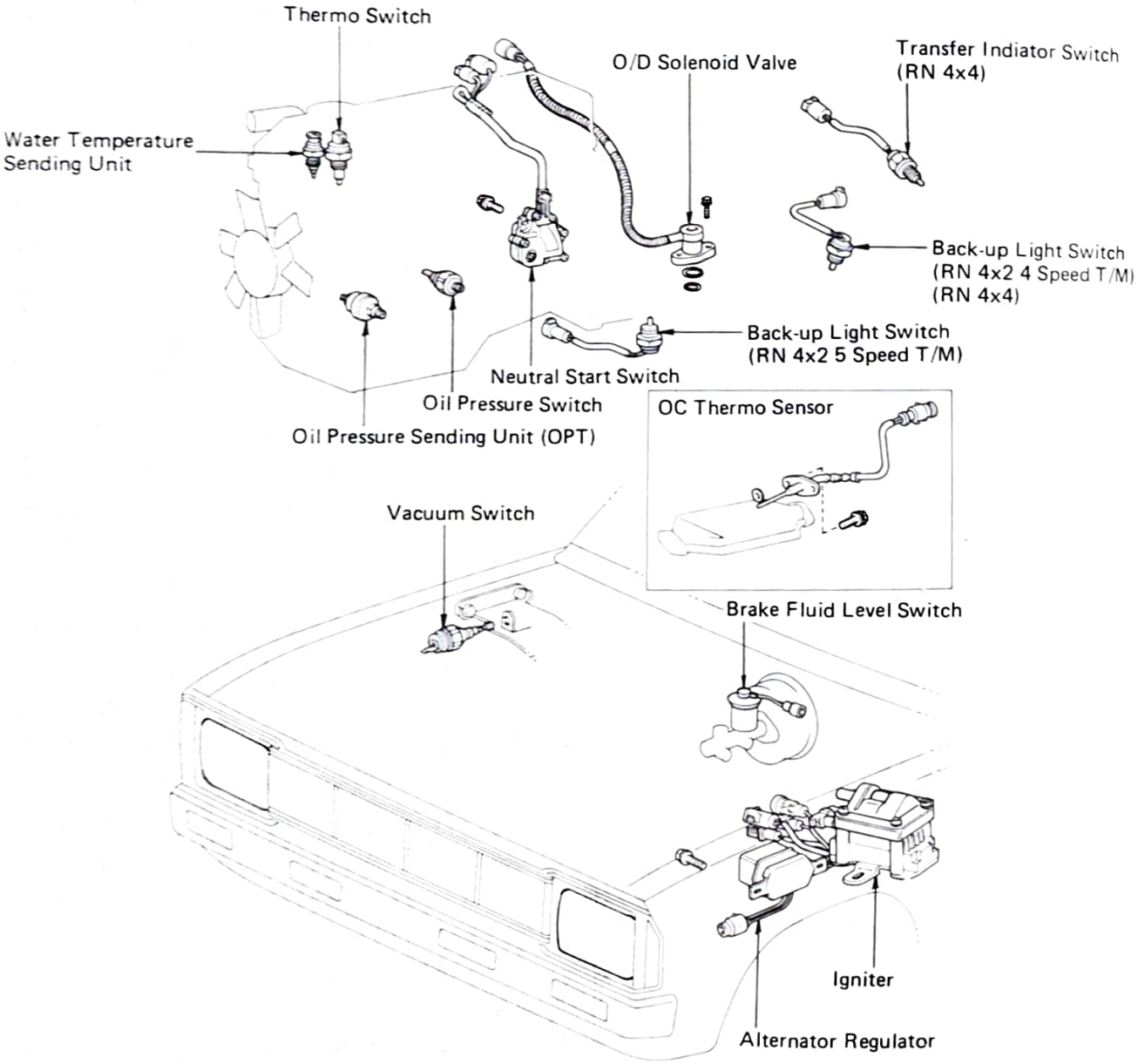
(a) Assemble the circuit breaker into the case.

(b) Install the circuit breaker assembly.

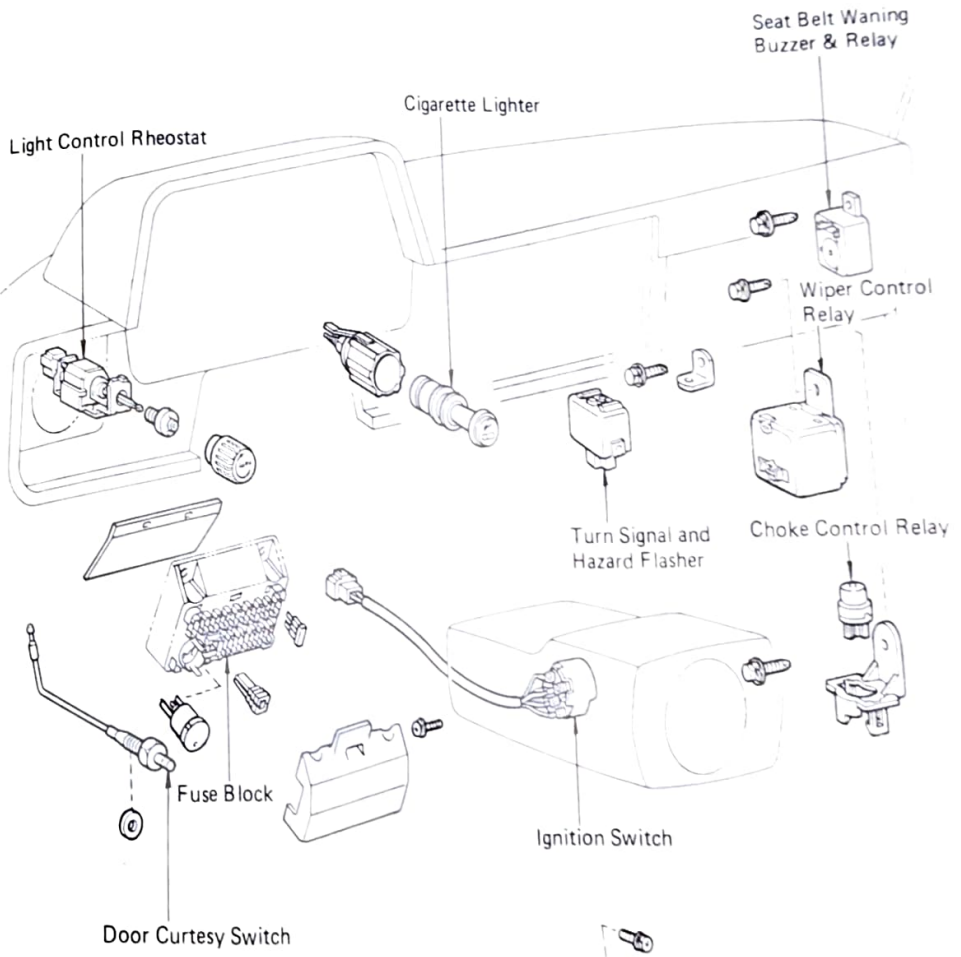
NOTE: If a circuit breaker continues to cut out, a short circuit is indicated and the system must be checked by a qualified technician.

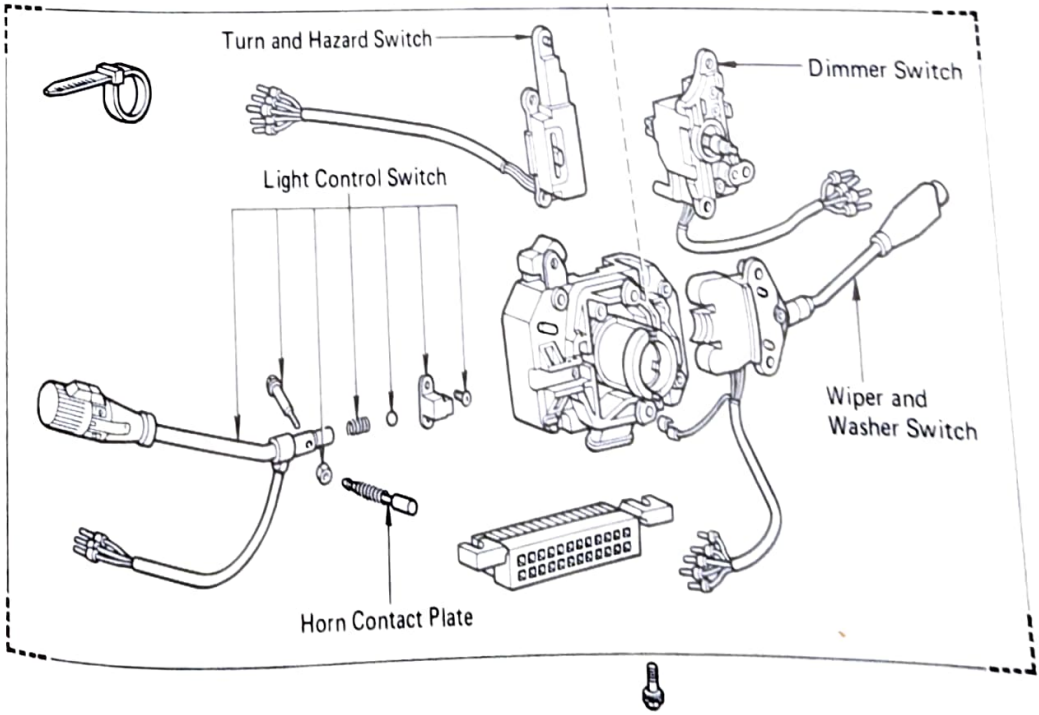
LOCATION OF SWITCHES AND RELAYS

ENGINE COMPARTMENT SWITCHES AND RELAYS

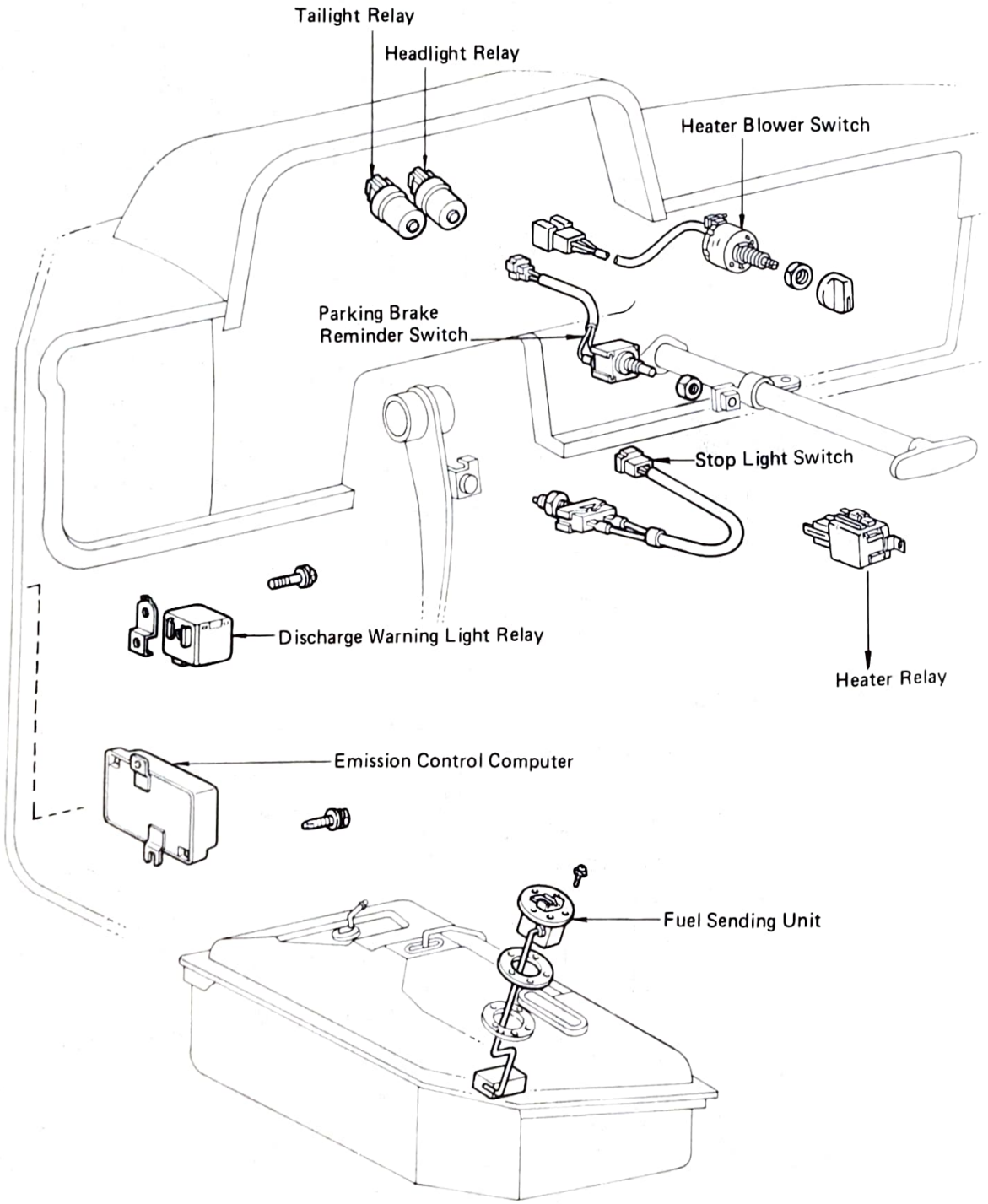


DASH AND STEERING COLUMN SWITCHES AND RELAYS



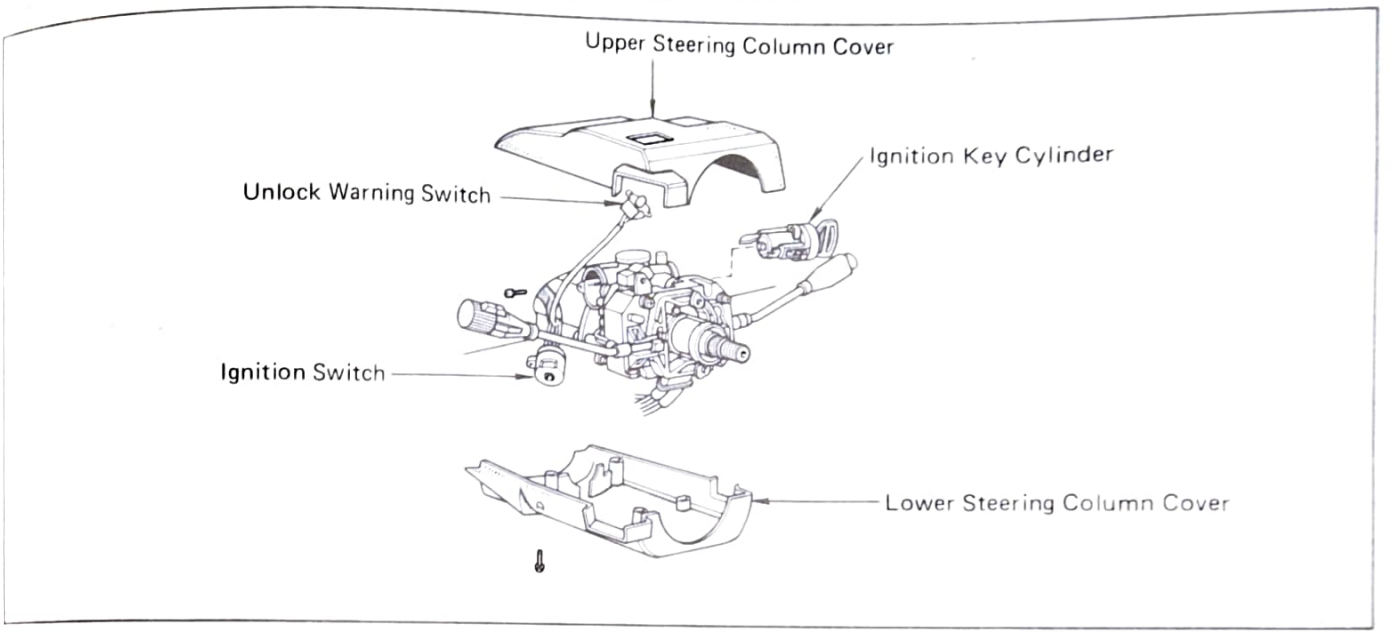


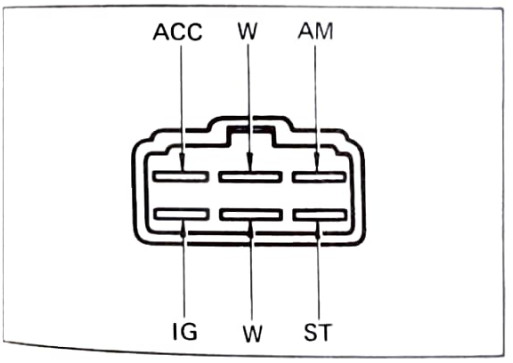
DASH AND STEERING COLUMN SWITCHES AND RELAYS (CONT'D)



SWITCHES

Ignition Switch





INSPECTION OF IGNITION SWITCH

1. REMOVE NEGATIVE CABLE FROM BATTERY
2. REMOVE STEERING LOWER COVER AND UPPER COVER
3. DISCONNECT IGNITION SWITCH WIRING CONNECTOR

Terminal (Wire color) / Switch position	AM (BR)	ACC (LR)	IG (BY)	ST (BW)	W (GW)	W (GW)
OFF or LOCK					○—○	
ACC	○—○				○—○	
ON	○—○	○—○	○—○			
START	○—○		○—○	○—○		

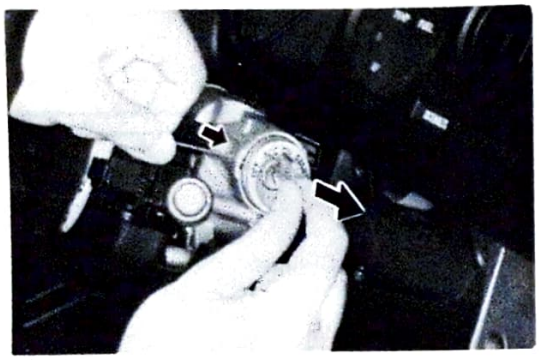
4. CHECK CONTINUITY BETWEEN TERMINALS

Using an ohmmeter, check the continuity of the terminals for each switch position shown in the table.

If there is no continuity, replace the ignition switch.

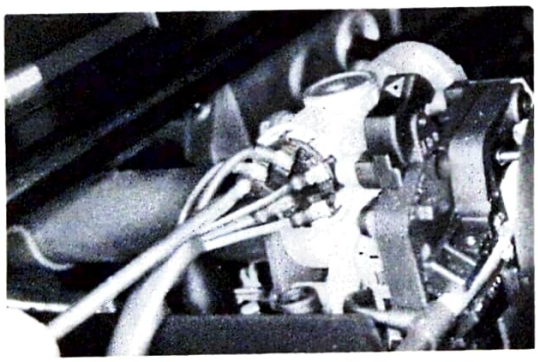
REMOVAL OF IGNITION SWITCH

1. REMOVE NEGATIVE CABLE FROM BATTERY
2. REMOVE STEERING LOWER COVER AND UPPER COVER
3. DISCONNECT IGNITION SWITCH WIRING CONNECTOR



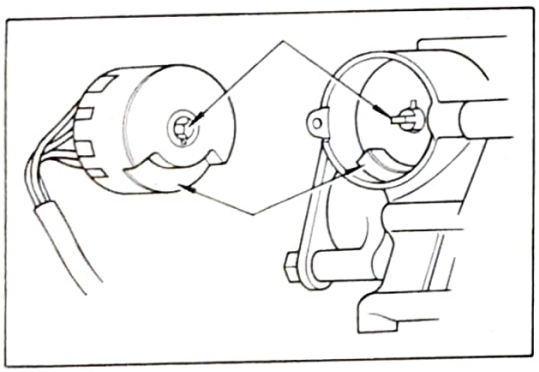
4. REMOVE IGNITION KEY CYLINDER
   (a) Turn the ignition key to ACC position.
   (b) Hold down the pin with a wire and pull out the ignition key and cylinder.

5. REMOVE UNLOCK WARNING SWITCH
   Remove the two screws and unlock warning switch.

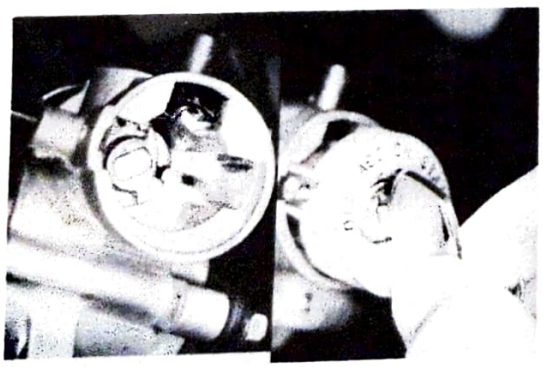


6. REMOVE IGNITION SWITCH
   Remove the screw and switch.

INSTALLATION OF IGNITION SWITCH



1. INSTALL IGNITION SWITCH
   (a) Install the unlock warning switch.
   (b) Install the ignition switch with the switch recess and bracket tab positioned as shown.
   (c) Install the screw.



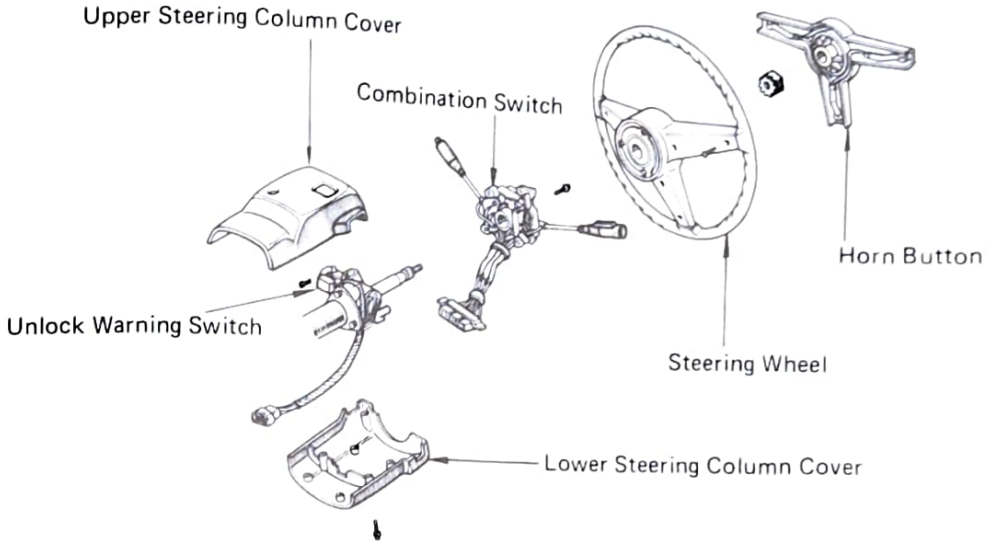
2. INSTALL IGNITION KEY CYLINDER
   (a) Position the bracket as shown.
   (b) With the key in ACC position, install the key cylinder.

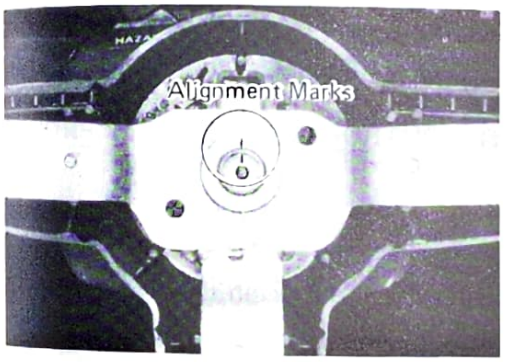
3. CONNECT IGNITION SWITCH WIRING CONNECTOR

4. INSTALL STEERING UPPER COVER AND LOWER COVER

5. INSTALL NEGATIVE CABLE ON BATTERY

Combination Switch





REMOVAL OF COMBINATION SWITCH

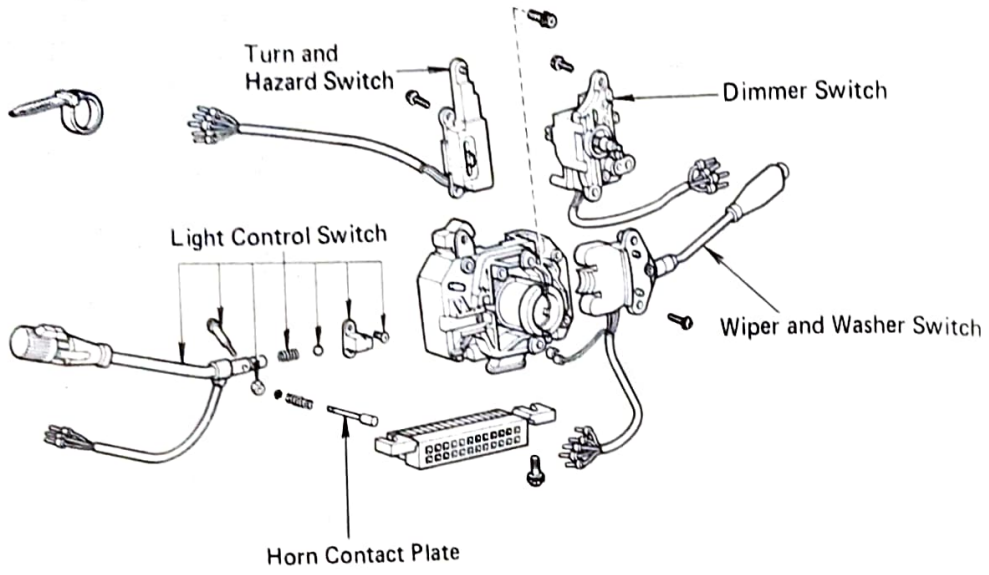
1. REMOVE NEGATIVE CABLE FROM BATTERY

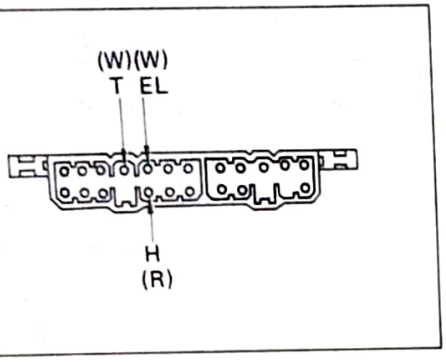
2. REMOVE STEERING WHEEL
   (a) Remove horn button screws on the back of the steering wheel and pull off the button.
   (b) Make alignment marks on the steering wheel and shaft to ensure correct reassembly.
   (c) Remove the steering wheel nut.
   (d) Using a steering wheel puller, remove the steering wheel.

   SST 09609-20010

3. REMOVE STEERING LOWER COVER AND UPPER COVER

4. REMOVE COMBINATION SWITCH



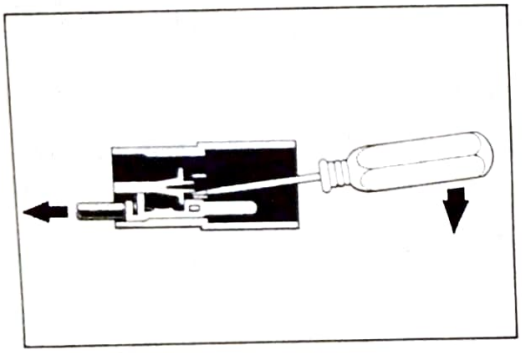


DISASSEMBLY OF COMBINATION SWITCH

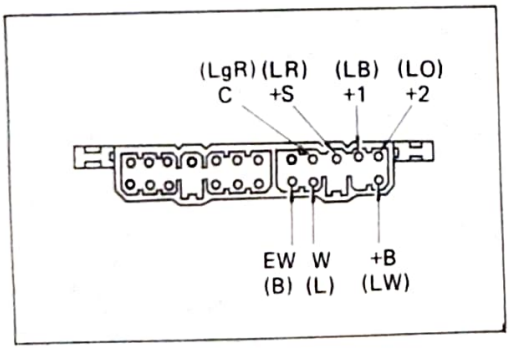
Removal of Light Control Switch

1. REMOVE LIGHT CONTROL SWITCH ARM FROM SWITCH BODY
   (a) Remove two screws and the retainer.
   (b) Remove the nut and set screw.

   NOTE: A steel ball will fall out when the arm is removed. Do not lose it.



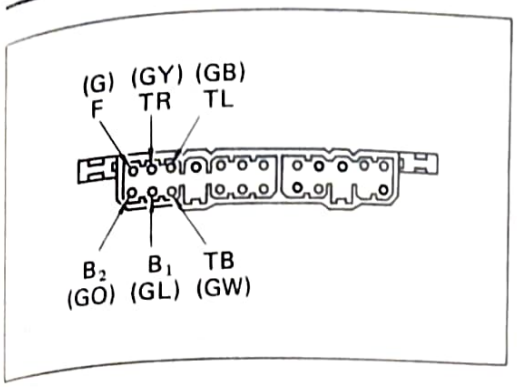
2. REMOVE THREE TERMINALS FROM CONNECTOR
   Remove terminals T, H and EL as follows:
   (a) From the open end, insert a miniture screwdriver between the locking lugs and terminal.
   (b) Pry up the locking lugs with the screwdriver and pull the terminal out from the rear.



Removal of Wiper Switch

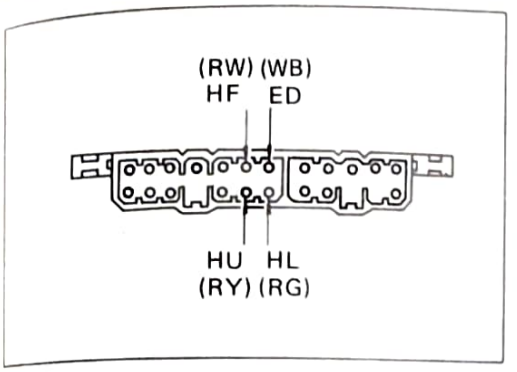
1. REMOVE WIPER SWITCH FROM SWITCH BODY
   Remove two screws and the wiper switch.

2. REMOVE SIX TERMINALS FROM CONNECTOR



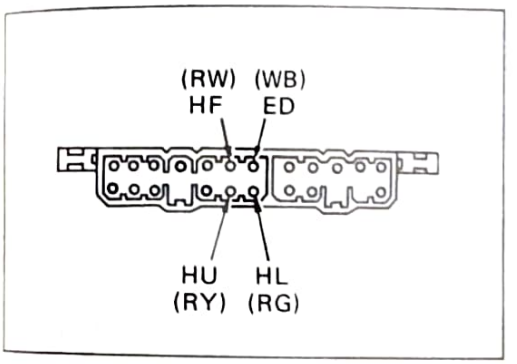
Removal of Hazard Switch

1. REMOVE HAZARD SWITCH FROM SWITCH BODY
   Remove two screws, and the hazard switch.
2. REMOVE SIX TERMINALS FROM CONNECTOR



Removal of Dimmer Switch

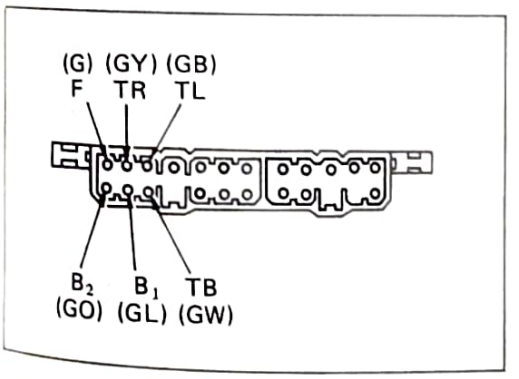
1. REMOVE DIMMER SWITCH FROM SWITCH BODY
   Remove three screws, and the dimmer switch.
2. REMOVE FOUR TERMINALS FROM CONNECTOR



ASSEMBLY OF COMBINATION SWITCH

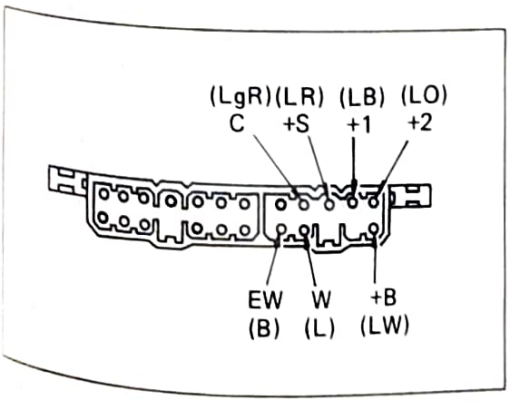
Installation of Dimmer Switch

1. INSTALL DIMMER SWITCH
2. INSTALL FOUR TERMINALS IN CONNECTOR



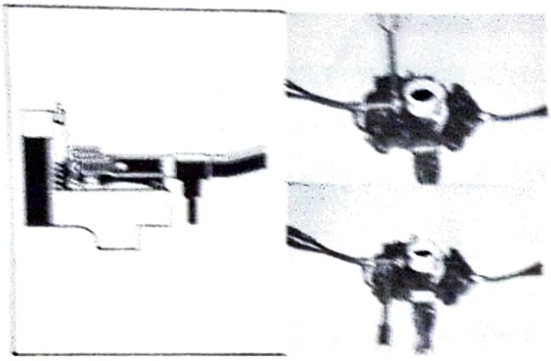
Installation of Hazard Switch

1. INSTALL HAZARD SWITCH
2. INSTALL SIX TERMINALS IN CONNECTOR



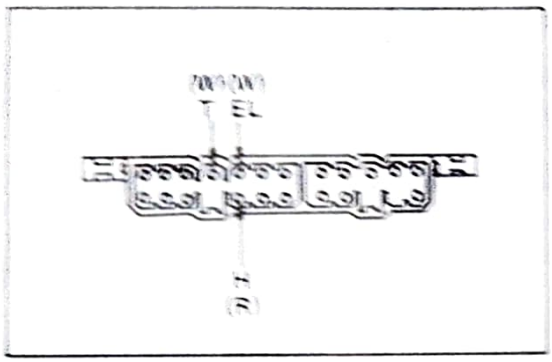
Installation of Wiper Switch

1. INSTALL WIPER SWITCH
2. INSTALL SIX TERMINALS IN CONNECTOR

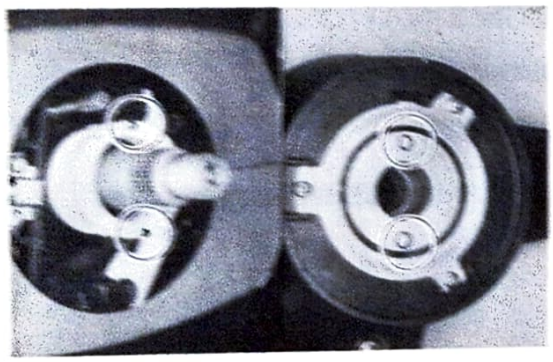


Installation of Light Control Switch

1. INSTALL LIGHT CONTROL SWITCH ARM
   (a) Insert the spring in the end of the arm. Place the switch arm in position on the switch body, and install the nut and screw.
   (b) Place the steel ball on the end of the switch arm and install the retainer as shown. Multipurpose grease may be used on the ball to hold it on the end of the arm.

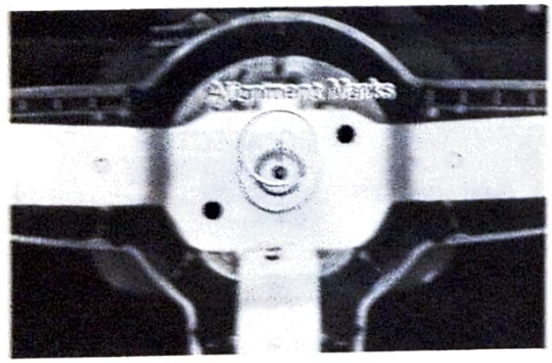


2. CHECK THAT LIGHT CONTROL SWITCH OPERATES SMOOTHLY
3. INSTALL THREE TERMINALS IN CONNECTOR

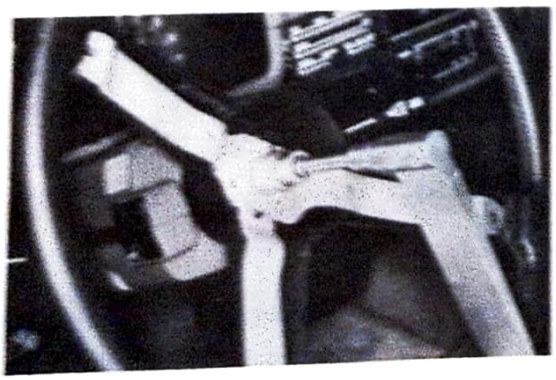


INSTALLATION OF COMBINATION SWITCH (See illustration on page 17-9)

1. INSTALL COMBINATION SWITCH ON STEERING COLUMN SHAFT
   (a) Place the switch on the shaft and install four screws.
   (b) Coat the horn contact plate with rubber grease.
   (c) Connect the switch connector.
2. INSTALL STEERING LOWER COVER AND UPPER COVER



3. INSTALL STEERING WHEEL
   (a) Align the auto-cancel switch with holes on the steering wheel.
   (b) Install the steering wheel on the shaft, making sure to align the alignment marks.
   (c) Check that the auto cancel action is correct by operating the turn signal and turning the steering wheel until the turn signal switches off.



   (d) Install and torque the steering wheel nut.
   Torque: 3.0 – 4.0 kg-m (22 – 28 ft-lb)
   (e) Install the horn button.
4. CONNECT NEGATIVE CABLE TO BATTERY

LIGHTING
Troubleshooting

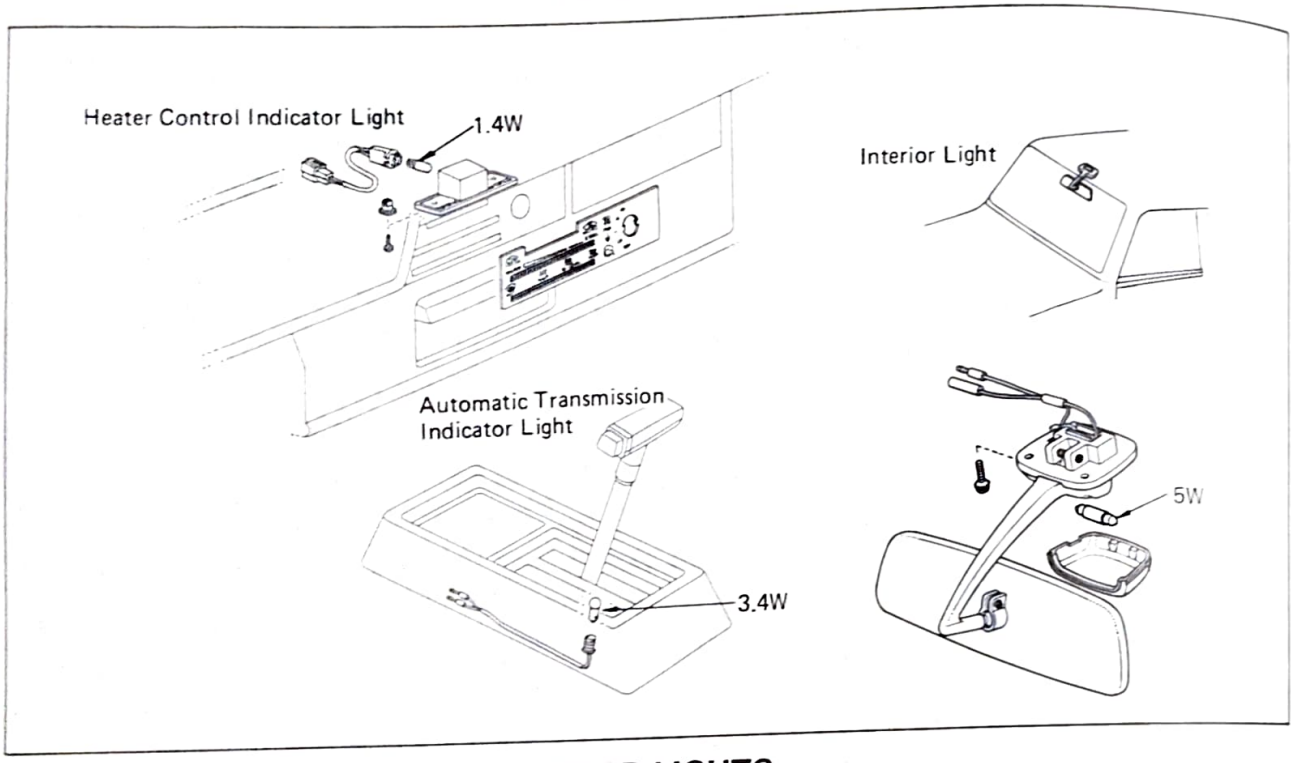
Problem	Possible cause	Remedy	Page
Only one light does not light (all exterior lights)	Light bulb burned out	Replace bulb	17-14
	Socket, wire or ground faulty	Repair as necessary	
No headlights light	Fusible link blown	Replace fusible link	
	Headlight control relay faulty	Check relay	17-16
	Light control/dimmer switch faulty	Check switch	17-16
	Wiring or ground faulty	Repair as necessary	
High beam headlights or headlight flasher do not operate	Light control/dimmer switch faulty	Check switch	17-16
	Faulty wiring	Repair as necessary	
Tail, parking and license light do not light	"TAIL" fuse blown	Replace fuse and check for short	
	Fusible link blown	Replace fusible link	
	Tail light control relay faulty	Check relay	17-16
	Light control switch faulty	Check switch	
	Wiring or ground faulty	Repair as necessary	
Stop lights do not light	"STOP" fuse blown	Replace fuse and check for short	
	Stop light switch faulty	Adjust or replace switch	17-6
	Wiring or ground faulty	Repair as necessary	
Stop lights stay on	Stop light switch faulty	Adjust or replace switch	17-6
Instrument light does not light (tail lights light)	Light control rheostat	Check rheostat	17-17
	Wiring or ground faulty	Repair as necessary	
Turn signal does not flash on one side	Turn signal switch faulty	Check switch	17-17
	Wiring or ground faulty	Repair as necessary	
Turn signal does not operate	"TURN" fuse blown	Replace fuse and check for short	
	Turn signal flasher faulty	Check flasher	17-18
	Turn signal/hazard switch faulty	Check switch	17-17
	Wiring or ground faulty	Repair as necessary	
Hazard warning lights do not operate	"HORN" fuse blown	Replace fuse and check for short	
	Turn signal flasher faulty	Check flasher	17-18
	Turn signal/hazard switch faulty	Check switch	17-17
	Wiring or ground faulty	Repair as necessary	

Light Bulbs

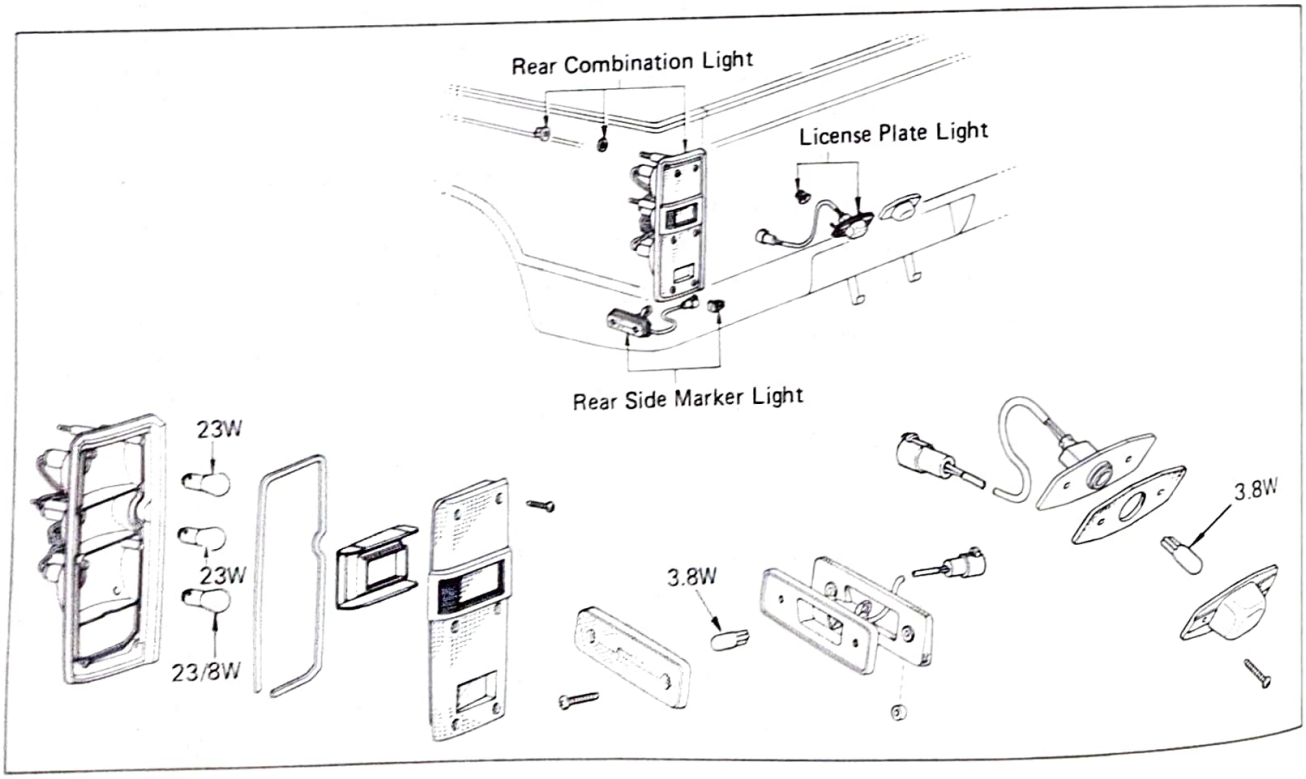
REPLACE LIGHT BULBS

Install new bulbs with the correct wattage rating.

INTERIOR LIGHTS

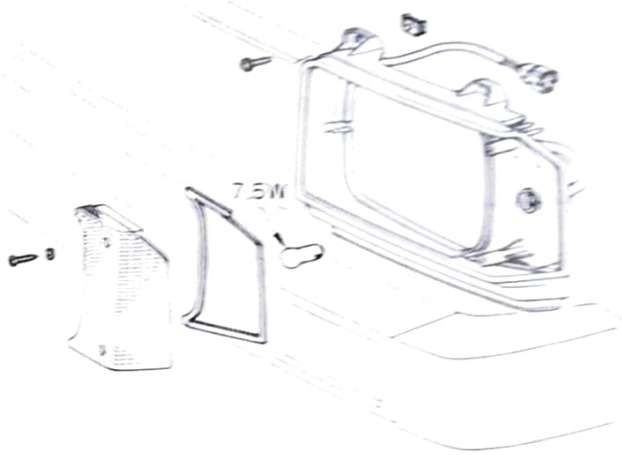


REAR LIGHTS

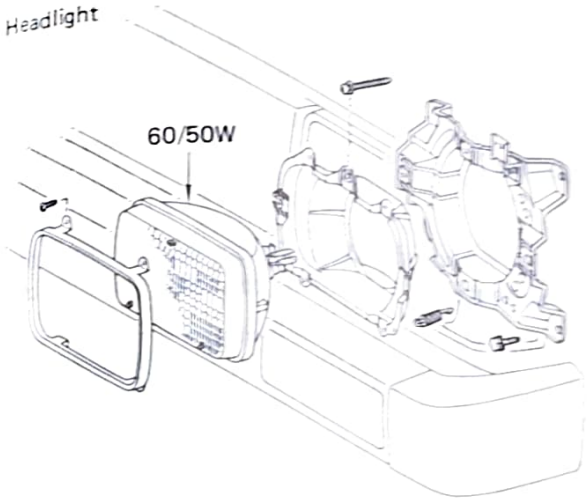


FRONT LIGHTS

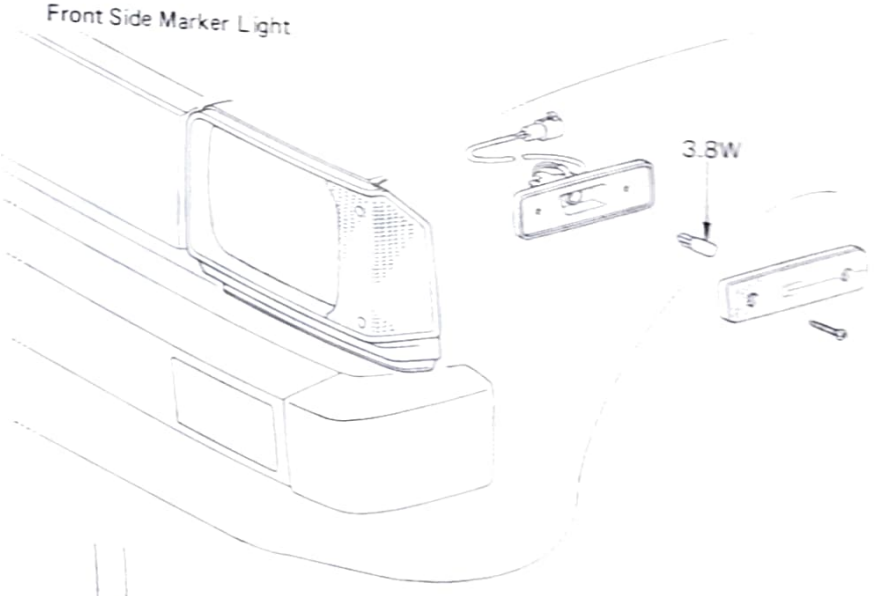
Front Parking Light



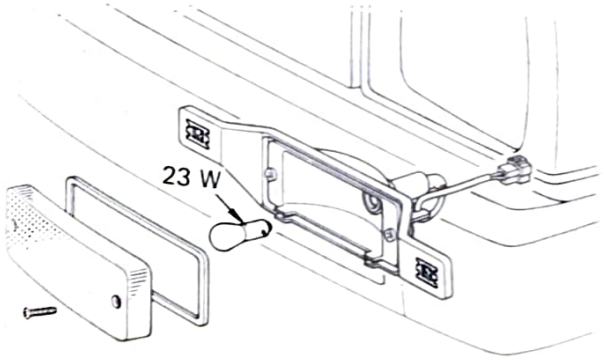
Headlight

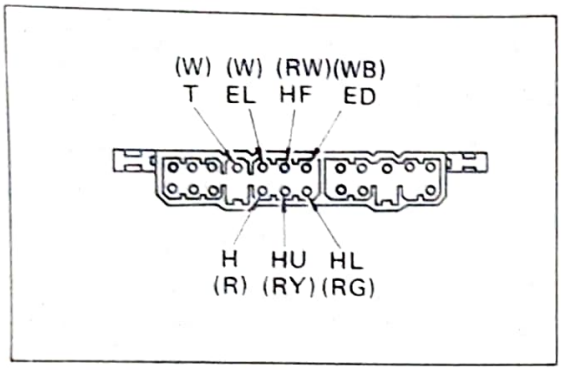


Front Side Marker Light



Front Turn Signal Light





Light Control Switch

INSPECTION OF LIGHT CONTROL SWITCH

1. REMOVE STEERING LOWER COVER AND UPPER COVER
2. DISCONNECT COMBINATION SWITCH CONNECTOR
3. CHECK CONTINUITY BETWEEN TERMINALS

Using an ohmmeter, check continuity of the terminals for each switch position shown in the table below.

If there is no continuity between the light control switch terminals, replace the light control switch.

If there is no continuity between the dimmer switch terminals, replace the dimmer switch.

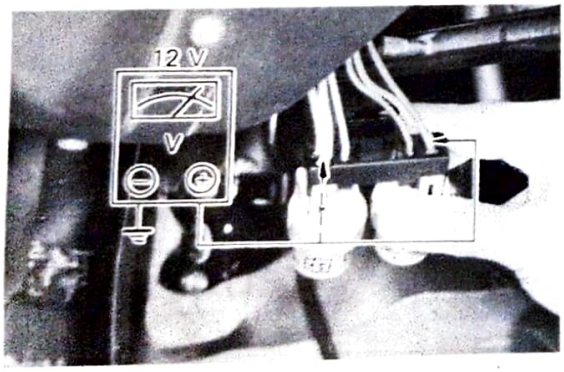
NOTE: Test probes should be inserted only from the wire harness side, as shown, to ensure proper contact.

Switch position \ Terminal (Wire color)	T (W)	H (R)	EL (W)	ED (WB)	HU (RY)	HL (RG)	HF (RW)
OFF	○		○				
ONE STEP	○		○				
TWO STEP	○	○	○				
Headlight High				○	○		
Headlight Low				○		○	
Headlight Flash				○	○		○

Light Control Relays (Headlight and Taillight)

INSPECTION OF LIGHT CONTROL RELAYS

NOTE: For the location of light control relays, see page 17-5.

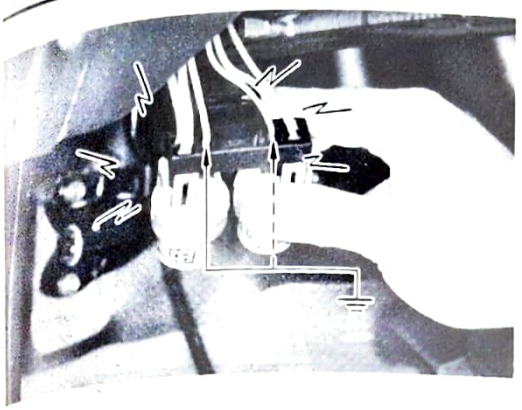


1. CHECK BATTERY VOLTAGE TO RELAYS

Using a voltmeter, check that there is 12 volts at the following terminals:

Headlight relay – red/blue wire
Taillight relay – red/yellow wire

If not 12 volts, check the TAIL fuse and/or wiring.



2. CHECK OPERATION OF RELAYS

When the following terminals are grounded, check that the relay click can be heard and the headlights and tail lights come on:

Headlight relay – red/white wire
Tail light relay – red/black wire

If the relay does not operate, replace the relay.

Light Control Rheostat

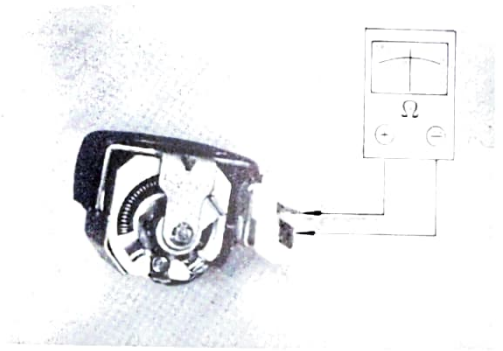
INSPECTION OF LIGHT CONTROL RHEOSTAT

NOTE: For the location of light control rheostat, see page 17-5.

CHECK RESISTANCE OF LIGHT CONTROL RHEOSTAT

Using an ohmmeter, measure the resistance at each point, while turning the DARK knob.

If resistance is not correct, replace the rheostat.



Point	Resistance (ohms)
Full counterclockwise	0
Midpoint	Approx. 4
Full clockwise	10

Turn Signal and Hazard Warning Light Switch

INSPECTION OF TURN SIGNAL AND HAZARD WARNING LIGHT SWITCH

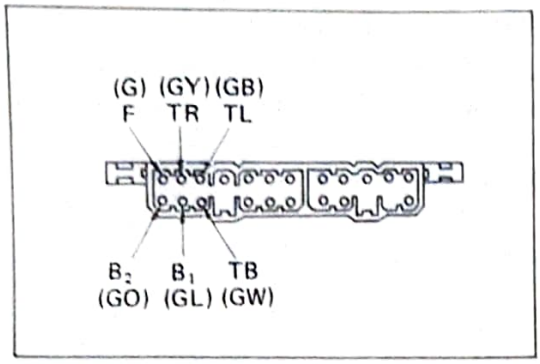
1. REMOVE STEERING LOWER COVER AND UPPER COVER

2. DISCONNECT COMBINATION SWITCH CONNECTOR

3. CHECK CONTINUITY BETWEEN TERMINALS

Using an ohmmeter, check the continuity of the terminals for each switch position shown in the table on the next page.

If there is no continuity between the switch terminals, replace the hazard switch.



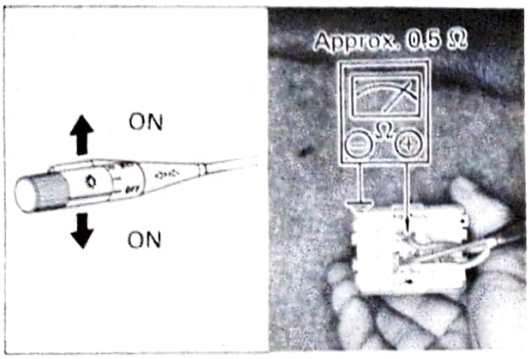
NOTE: Test probes should be inserted only from the wire harness side, as shown, to ensure proper contact.

Switch position	Terminal (Wire color)	TL (GB)	TB (GW)	TR (GY)	B1 (GL)	F (G)	B2 (GO)
Turn Signal	R		○—○		○—○		
	N				○—○		
	L	○—○			○—○		
Hazard		○—○	○—○	○—○		○—○	

Turn Signal Flasher

INSPECTION OF TURN SIGNAL FLASHER

NOTE: For the location of the turn signal flasher, see page 17-5.

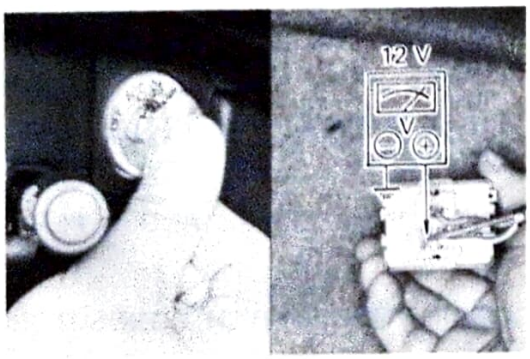


1. CHECK TURN SIGNAL CIRCUIT

(a) Move the turn signal switch to the right or left position.

(b) Using an ohmmeter, measure the resistance between terminal L (green/white wire) of the flasher and ground. If the resistance is not approximately 0.5 ohm, troubleshoot the turn signal circuit.

NOTE: If the turn indicator light stays lit, one of the front or rear turn signal lights has an open circuit.



2. CHECK FLASHER OPERATION

(a) Turn the ignition key to ON.

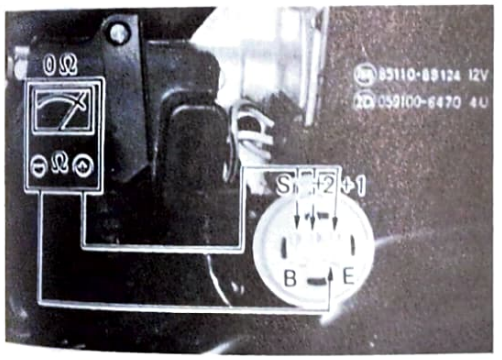
(b) Using a voltmeter, measure the voltage between terminal B (green wire) of the flasher and ground. If the voltage is not 12 volts, replace the turn signal flasher.

(c) Check that the turn signal lights flash 70 to 100 times per minute. If not, replace the flasher.

WIPER AND WASHER

Troubleshooting

Problem	Possible cause	Remedy	Page
Wipers do not operate of return to off position	"WIPER" fuse blown	Replace fuse and check for short	
	Wiper motor faulty	Check motor	17-19
	Wiper control switch faulty	Check switch	17-20
	Wiring or ground faulty	Repair as necessary	
Wipers do not operate in INT position	Wiper control relay faulty	Check relay	17-21
	Wiper control switch faulty	Check switch	17-20
	Wiper motor faulty	Check motor	17-19
	Wiring or ground faulty	Repair as necessary	
Washer does not operate	Washer hose or nozzle clogged	Repair as necessary	
	Washer motor faulty	Replace motor	17-21
	Wiper control switch faulty	Check switch	17-20
	Wiring faulty	Repair as necessary	



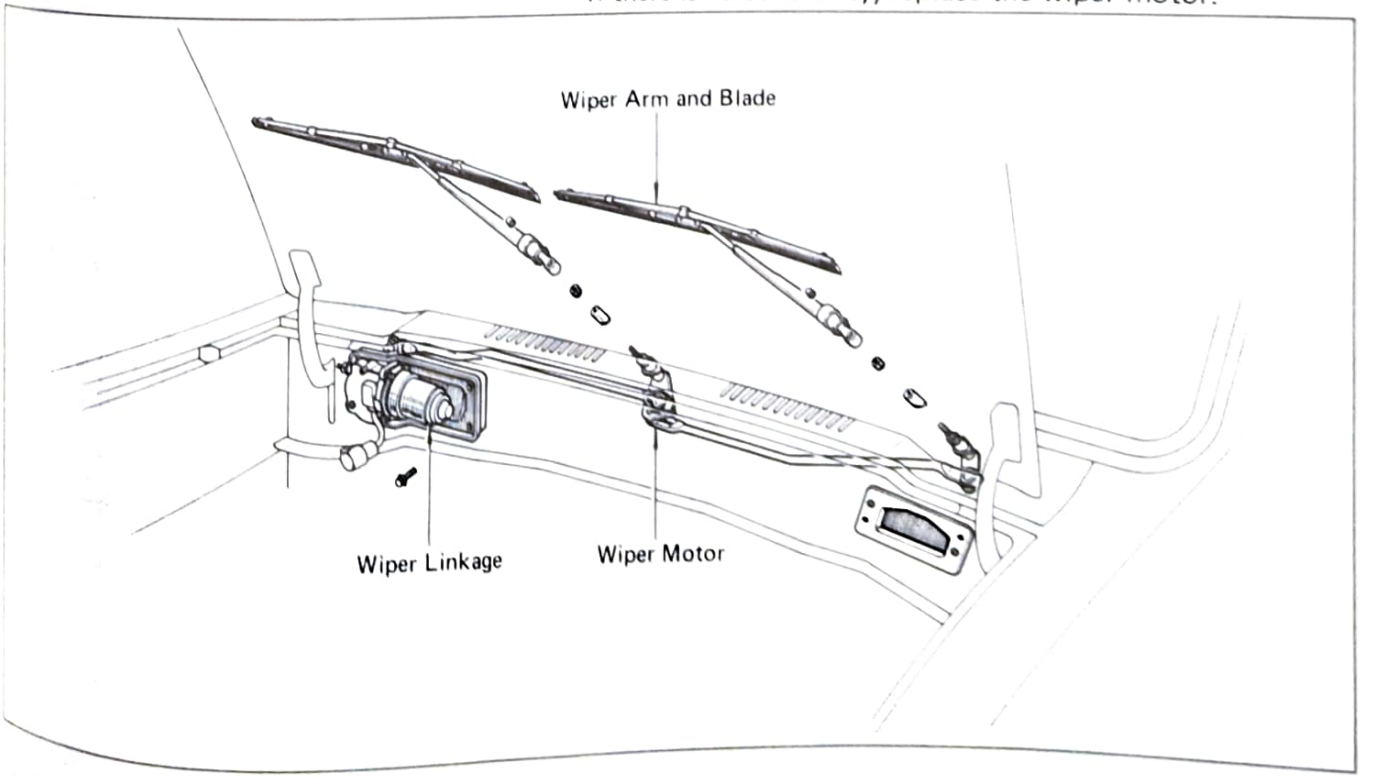
Wiper Motor and Linkage

INSPECTION OF WIPER MOTOR

1. PLACE WIPER SWITCH IN OFF POSITION
2. REMOVE CONNECTOR FROM WIPER MOTOR
3. CHECK MOTOR FOR CONTINUITY

   Using an ohmmeter, check for continuity between terminal E and terminals +1, +2 and S.

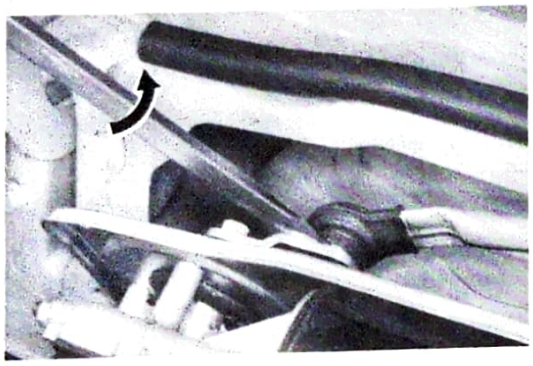
   If there is no continuity, replace the wiper motor.



REMOVAL OF WIPER MOTOR AND LINKAGE

1. REMOVE WIPER ARMS AND BLADES

   Remove the nut and wiper arm.



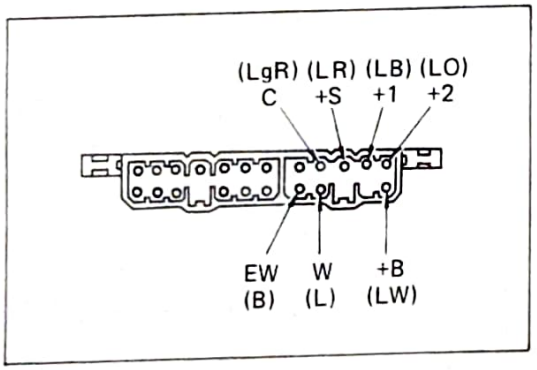
2. DISCONNECT LINKAGE FROM WIPER CRANK ARM

   Insert a screwdriver between the link and arm, and pry the link from the arm.

3. DISCONNECT ELECTRICAL CONNECTOR AND REMOVE WIPER MOTOR

4. REMOVE WIPER LINKAGE

   Remove nuts holding pivot arms, and remove the wiper linkage.



Wiper and Washer Switch

INSPECTION OF WIPER AND WASHER SWITCH

1. REMOVE STEERING LOWER COVER AND UPPER COVER

2. DISCONNECT COMBINATION SWITCH CONNECTOR

   Push both lock levers in while pulling apart the connector.

3. CHECK CONTINUITY BETWEEN TERMINALS

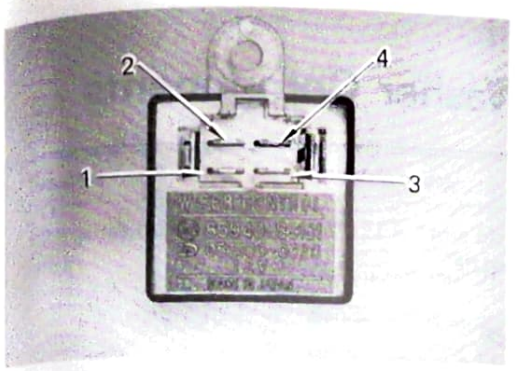
   Using an ohmmeter, check the continuity of the terminals for each switch position shown in the table below.

   If there is no continuity between the wiper switch terminals, replace the wiper switch.

   If there is no continuity between the washer switch terminals, replace the wiper switch.

   NOTE: Test probes should be inserted only from the wire harness side as shown, to ensure proper contact.

Switch position \ Terminal (Wire color)	B (LW)	S (LR)	+1 (LB)	+2 (LO)	C (LgR)	EW (B)	W (L)
OFF		○	○				
INT		○	○		○	○	
LOW	○		○				
HI	○			○			
WASHER						○	○



Wiper Control Relay

INSPECTION OF WIPER CONTROL RELAY

NOTE: Before inspecting, check that wipers other than the intermittent wiper operate properly.

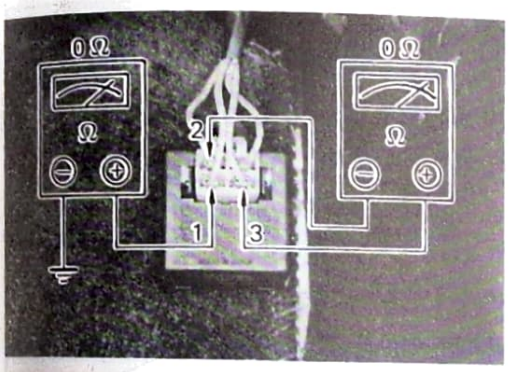
1. CHECK RELAY FOR CONTINUITY

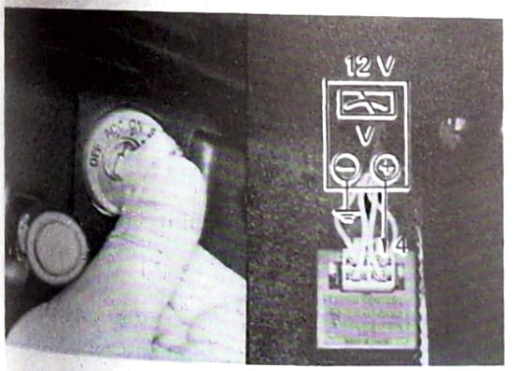
(a) Place the wiper switch lever in the INT position.

(b) Using an ohmmeter, check for continuity between terminals 2 and 3.

(c) Using an ohmmeter, check for continuity between terminals 1 and body ground.

If there is no continuity in either of the checks above, replace the wiper control relay.





2. CHECK BATTERY VOLTAGE TO RELAY

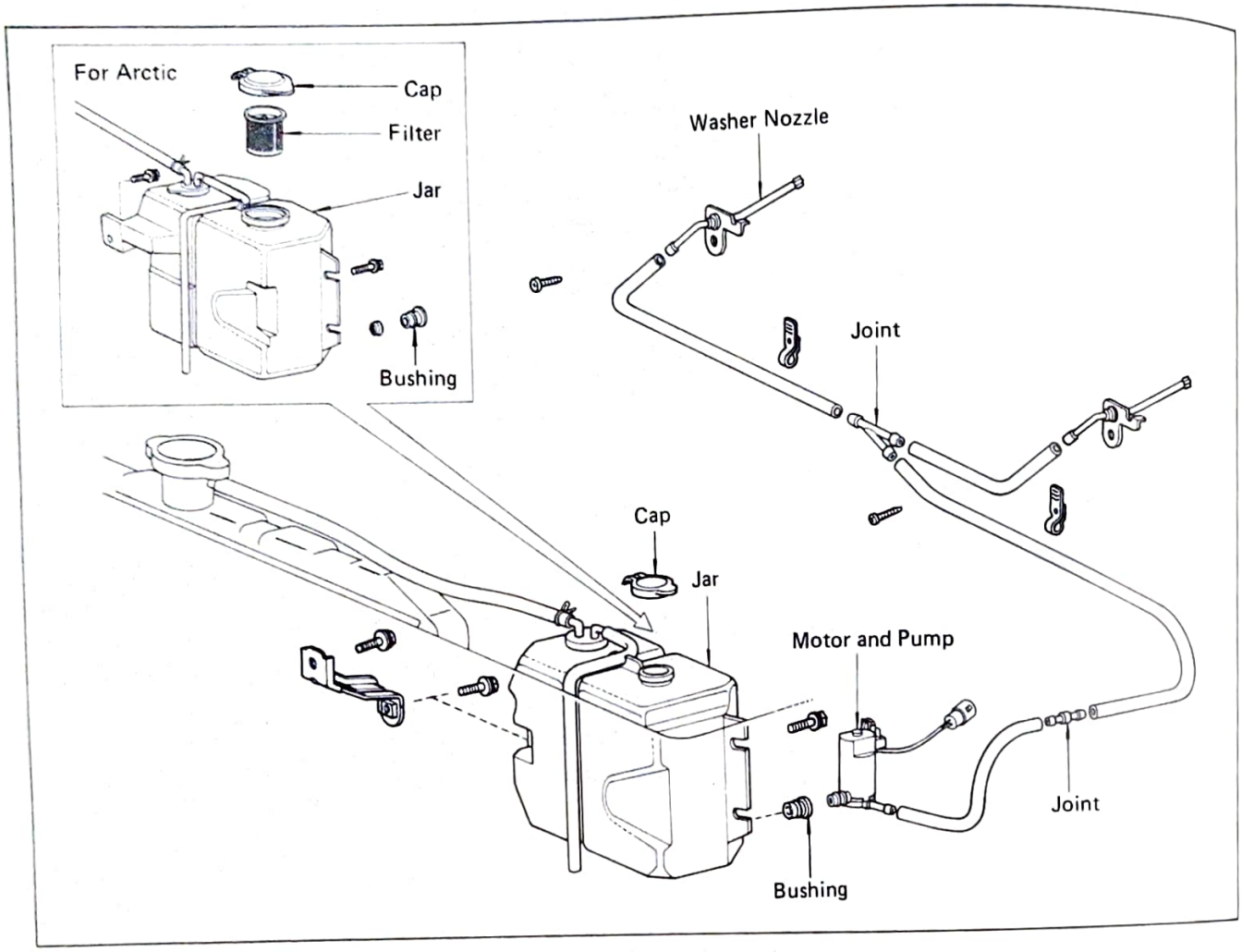
(a) Turn the ignition key and the wiper switch to ON.

(b) Using a voltmeter, measure the voltage between the terminal 4 and body ground.

If the voltage is not 12 volts, replace the wiper control relay.

WASHER

Windshield Washer Components



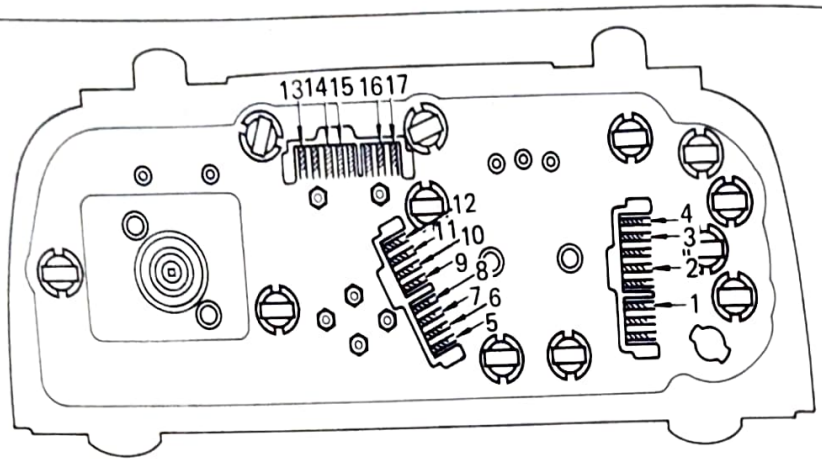
PEPLACEMENT OF WASHER COMPONENTS

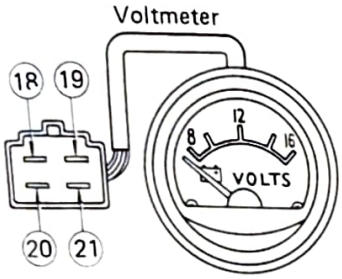
REPLACE WASHER COMPONENT AS NECESSARY TO REPAIR WASHER SYSTEM

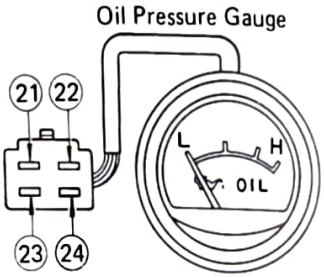
INSTRUMENTS AND SENDING UNITS
Troubleshooting

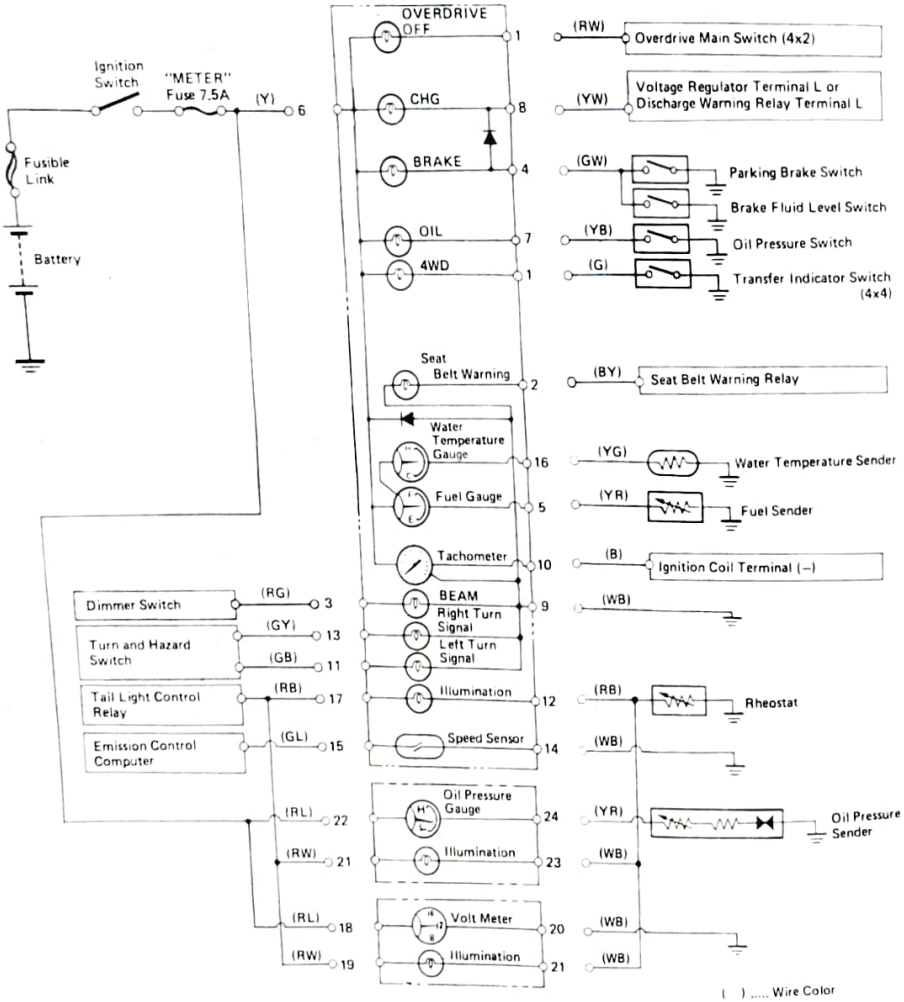
Problem	Possible cause	Remedy	Page
Fuel gauge does not work	"METER" fuse blown	Replace fuse and check for short	
	Fuel gauge faulty	Check gauge	17-26
	Sending unit faulty	Check sending unit	17-29
	Wiring or ground faulty	Repair as necessary	
Water temperature gauge does not work	"METER" fuse blown	Replace fuse and check for short	
	Water temperature gauge faulty	Check gauge	17-26
	Water temperature sending unit faulty	Check sending unit	17-29
	Wiring or ground faulty	Repair as necessary	
Low oil pressure warning light does not light	"METER" fuse blown	Replace fuse and check for short	
	Bulb burned out	Replace bulb	
	Oil pressure switch faulty	Check switch	17-30
	Wiring or ground faulty	Repair as necessary	
Discharge warning light does not light	"METER" fuse blown	Replace fuse and check for short	
	Bulb burned out	Replace bulb	
	Wiring faulty	Repair as necessary	
Parking brake warning light does not light	"METER" fuse blown	Replace fuse and check for short	
	Bulb burned out	Replace bulb	
	Parking brake warning switch faulty	Check switch	17-24
	Wiring or ground faulty	Repair as necessary	
Transfer indicator light does not light	"METER" fuse blown	Replace fuse and check for short	
	Bulb burned out	Replace bulb	
	Indicator light switch faulty	Check switch	17-28
	Wiring or ground faulty	Repair as necessary	
Voltmeter does not work	Fuses blown	Replace in-line fuse and check for short	
	Voltmeter faulty	Check voltmeter	17-29
	Wiring faulty	Repair as necessary	
Tachometer does not work	"METER" fuse blown	Replace fuse and check for short	
	Tachometer faulty	Check tachometer	17-26
	Wiring faulty	Repair as necessary	

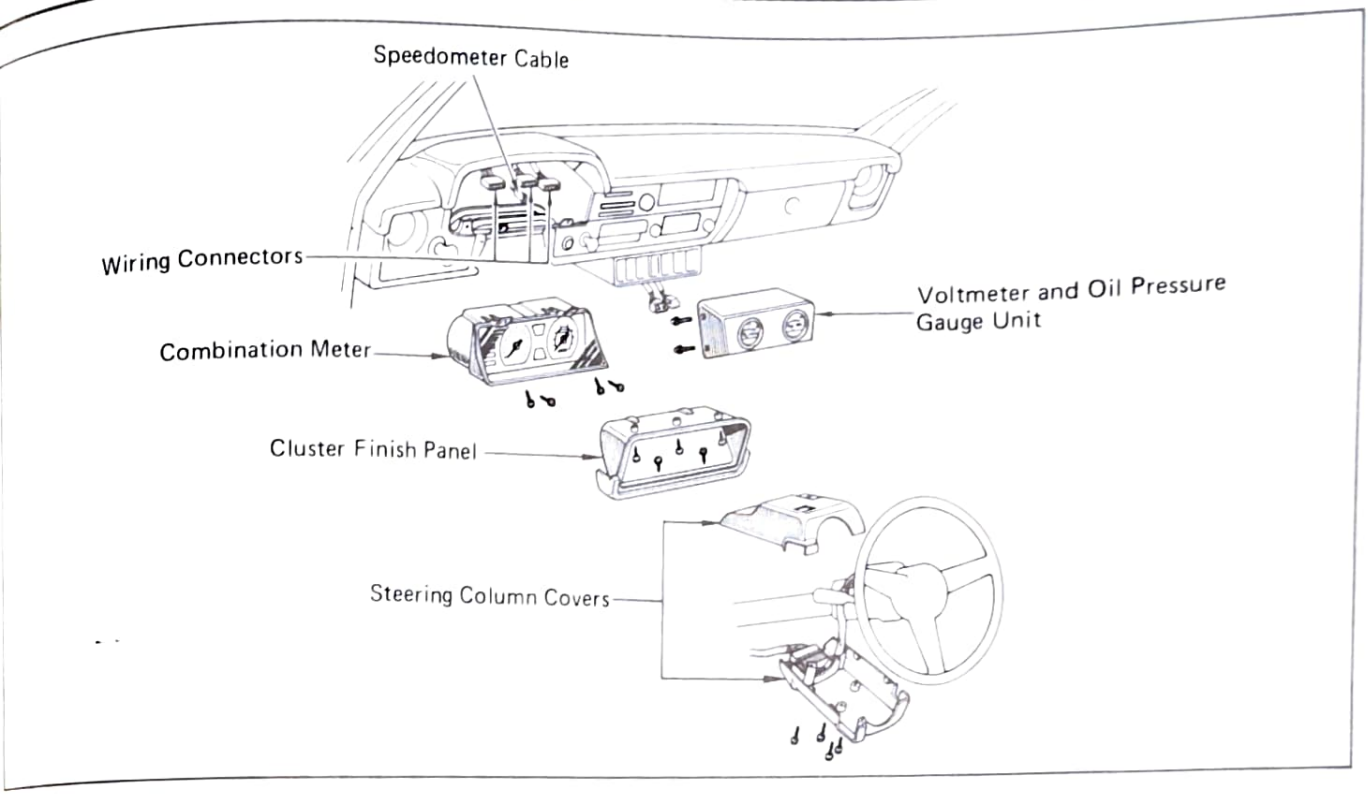
Meters and Gauges

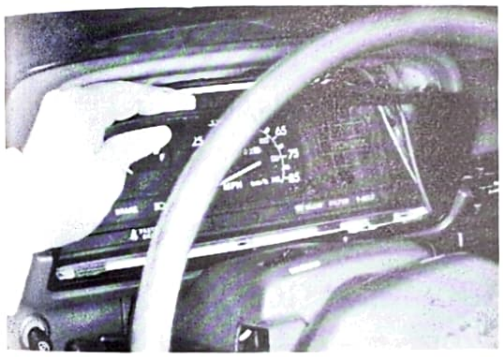










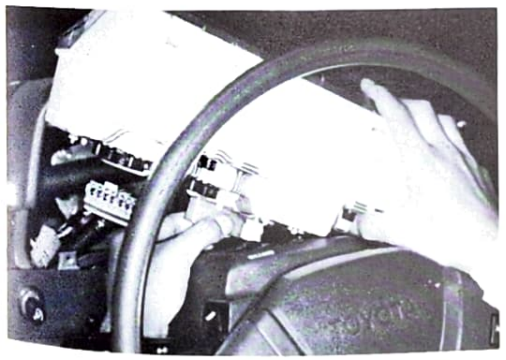


REMOVAL OF COMBINATION METER

1. DISCONNECT NEGATIVE CABLE FROM BATTERY TERMINAL

2. REMOVE CLUSTER FINISH PANEL

   Remove five screws.

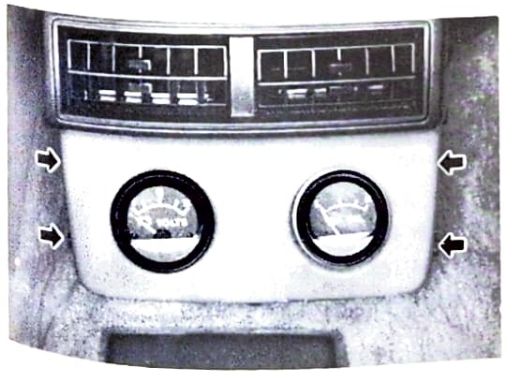


3. REMOVE COMBINATION METER

   (a) While pushing the lock lever, pull out the speedometer cable.

   (b) Remove four screws.

   (c) Pull out the meter, and disconnect three wiring connectors.



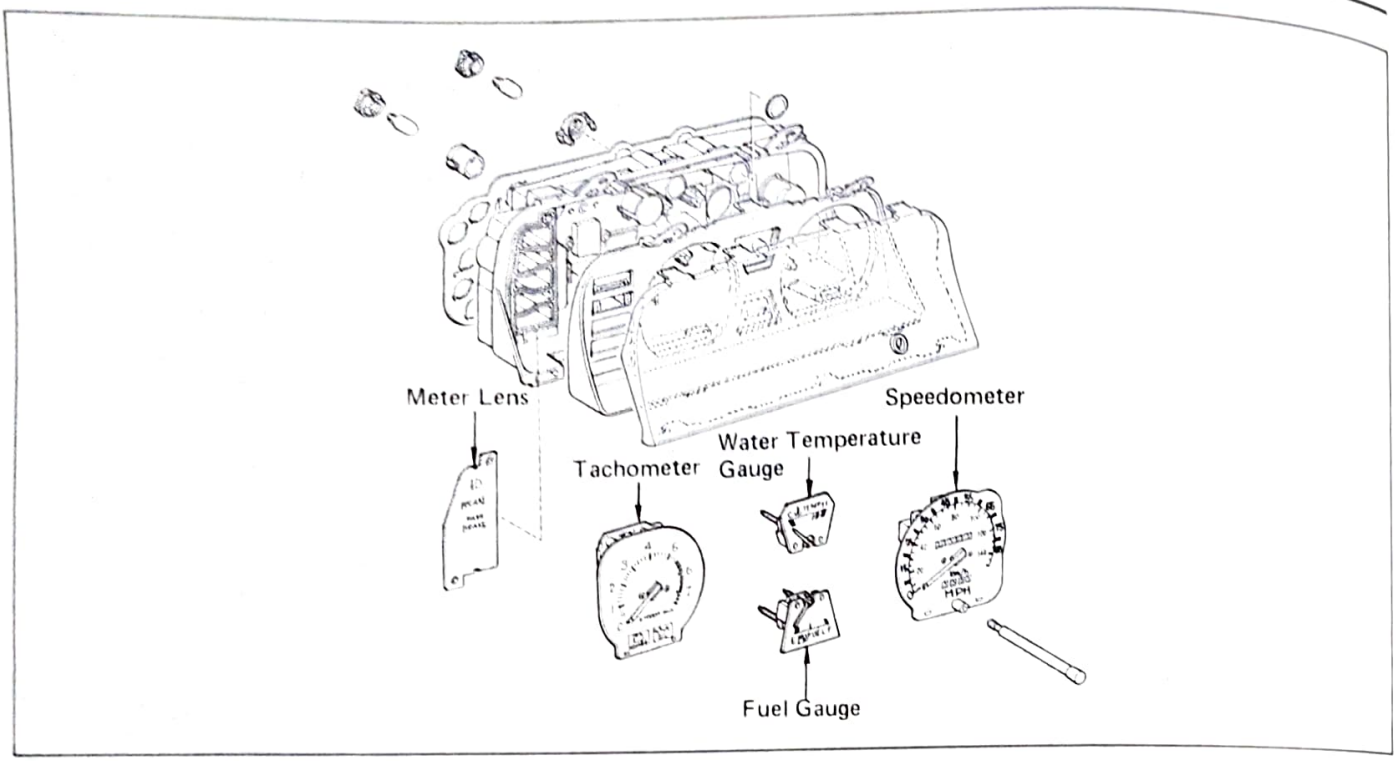
REMOVAL OF VOLTMETER AND OIL PRESSURE GAUGE UNIT

1. DISCONNECT NEGATIVE CABLE FROM BATTERY TERMINAL

2. REMOVE VOLTMETER AND OIL PRESSURE GAUGE UNIT

   (a) Remove four screws.

   (b) Disconnect two wiring connectors, and take off the unit.



DISASSEMBLY AND ASSEMBLY OF COMBINATION METER

REPLACE COMPONENTS AS NECESSARY TO REPAIR COMBINATION METER

INSPECTION OF COMBINATION METER

Speedometer

ON-VEHICLE INSPECTION OF SPEEDOMETER

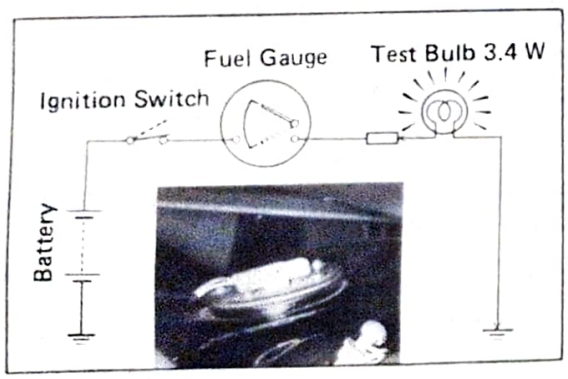
(a) Using a speedometer tester, inspect the speedometer for allowable indicating error and operation of odometer.

NOTE: Tire wear and tire over or under inflation will increase the indicating error.

(b) Check the speedometer for pointer vibration and abnormal noises.

NOTE: Pointer vibration can be caused by a loose speedometer cable.

Standard Indicator (mph)	Allowable Error (mph)
20	18.5 – 21.5
40	38.5 – 41.5
55	53.5 – 56.5



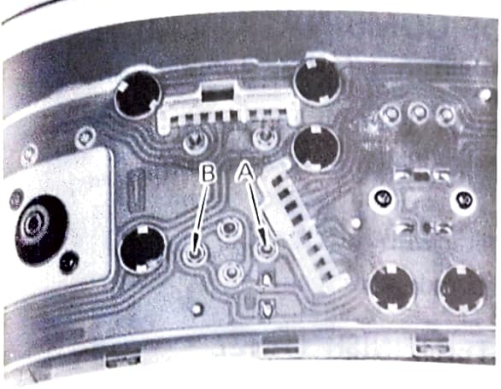
Fuel Gauge

1. ON-VEHICLE INSPECTION OF FUEL GAUGE

(a) Disconnect the connector from the fuel sending unit. Ground the terminal through a 3.4 W bulb, as shown.

(b) Turn the ignition switch to ON. Check that the bulb starts flashing after several seconds and the fuel gauge needle vibrates.

If indications are not correct, remove and test the fuel gauge.



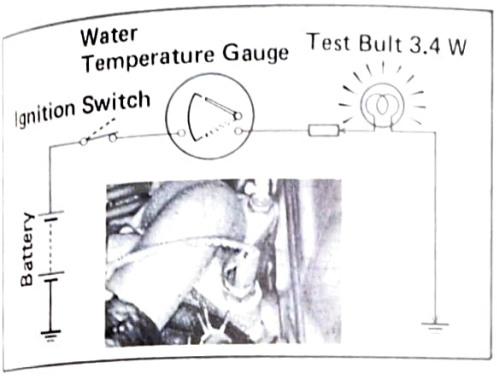
2. TEST OF FUEL GAUGE

(a) Using an ohmmeter, measure the resistance between terminals A and B.

Resistance: 25 ohms

(b) Connect a connector to the combination meter. Turn the ignition switch to ON. Using a voltmeter, check that there is 2 – 7 volts at terminal A.

If not, replace the fuel gauge.



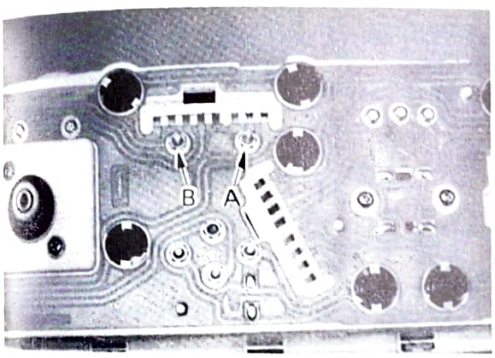
Water Temperature Gauge

1. ON-VEHICLE INSPECTION OF WATER TEMPERATURE GAUGE

(a) Disconnect the connector from the water temperature sending unit. Ground the terminal through a 3.4 W bulb as shown.

(b) Turn the ignition switch to ON. Check that the bulb starts flashing after several seconds and the water temperature gauge needle vibrates.

If indications are not correct, remove and test the water temperature gauge.



2. TEST OF WATER TEMPERATURE GAUGE

(a) Using an ohmmeter, measure the resistance between terminals A and B.

Resistance: 25 ohms

(b) Connect the connector to the combination gauge. Turn the ignition switch to ON. Using a voltmeter, check that there is 2 – 7 volts at terminal A.

If the above checks are not correct, replace the water temperature gauge.

Tachometer

ON-VEHICLE INSPECTION OF TACHOMETER

(a) Connect a tune-up test tachometer, and start the engine.

(b) Compare the tester and tachometer indications.

If the error is excessive, replace the tachometer.

CAUTION:

(a) Do not reverse the connection of the tachometer because transistors and diodes inside will be damaged.

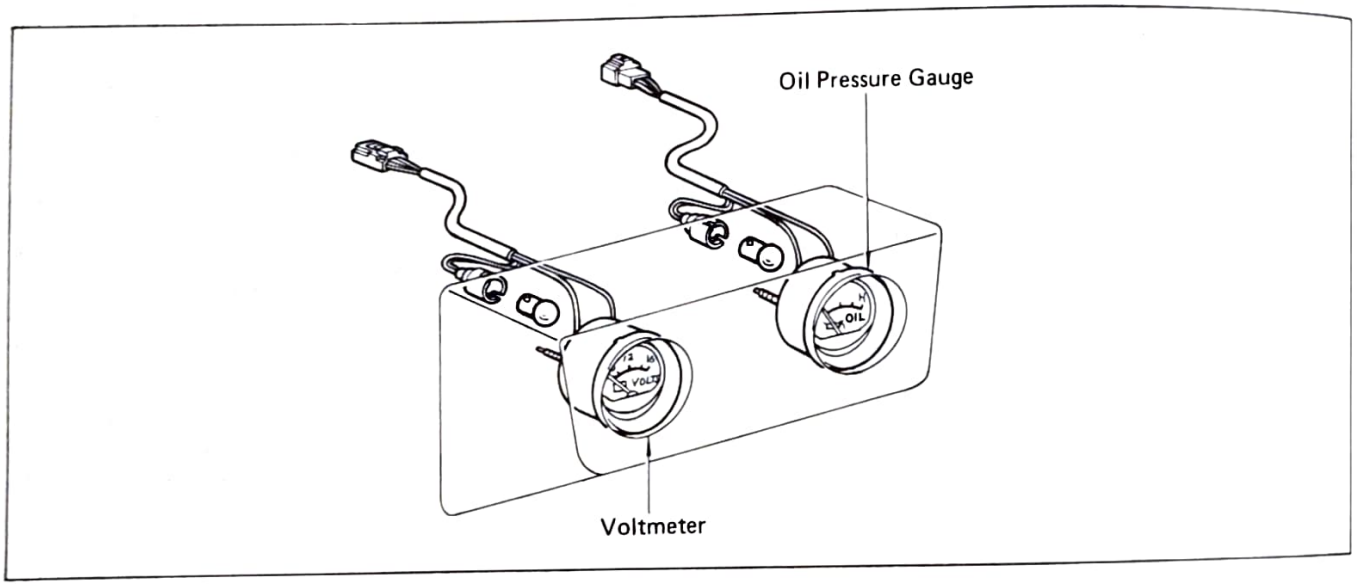
(b) When removing or installing the tachometer, be careful not to drop it or subject it to heavy shocks.

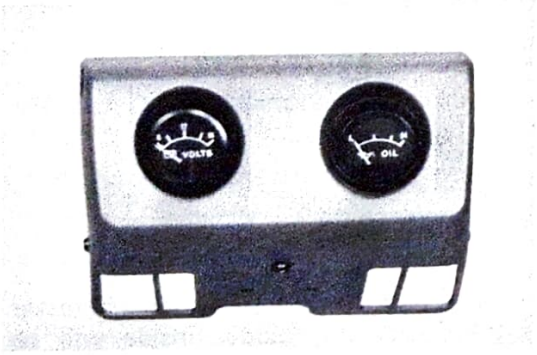
Engine tachometer allowable error

Temp. \ rpm	1,000	3,000	5,000	7,000
20°C DC13V	±100	±150	±150	±210
−20°C to +60°C 10.0 – 15.6V	±150	±200	±350	±420

INSTALLATION OF COMBINATION METER (See illustration on page 17-25)

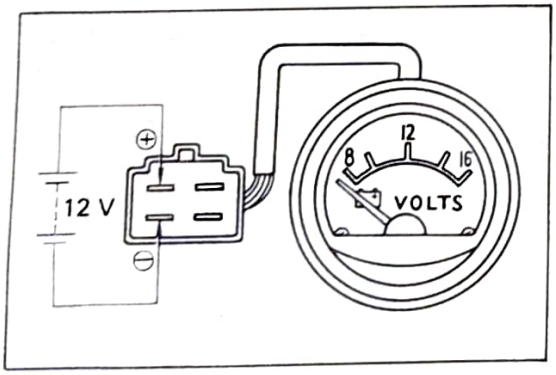
1. INSTALL COMBINATION METER
   (a) Connect four wiring connectors and the speedometer cable.
   (b) Install the meter with four screws.
   (c) Connect the speedometer cable.
2. INSTALL CLUSTER FINISH PANEL
3. INSTALL STEERING COLUMN COVERS
4. CONNECT NEGATIVE CABLE TO BATTERY TERMINAL





DISASSEMBLY AND ASSEMBLY OF VOLTMETER AND OIL PRESSURE GAUE UNIT

REPLACE COMPONENT AS NECESSARY TO REPAIR VOLTMETER AND OIL PRESSURE GAUGE UNIT



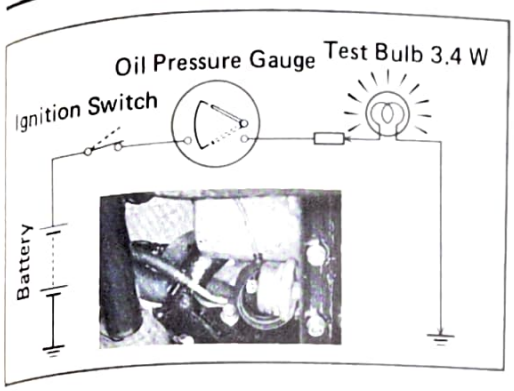
INSTALLATION OF VOLTMETER AND OIL PRESSURE GAUGE UNIT

Voltmeter

INSPECTION OF VOLTMETER

Connect a 12-volt battery between the terminals as shown.

Check that the voltmeter indicates about 12 volts. If not, replace the voltmeter.



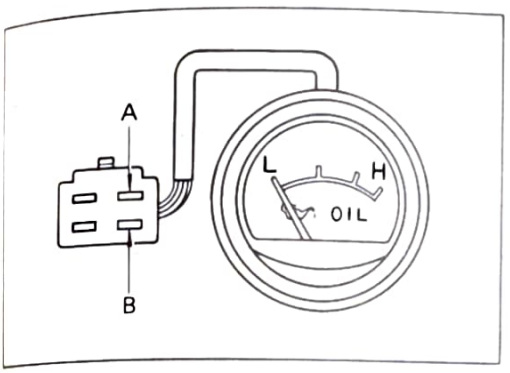
Oil Pressure Gauge

1. ON-VEHICLE INSPECTION OF OIL PRESSURE GAUGE

   (a) Disconnect the connector from the oil pressure sending unit. Ground the terminal through a 3.4 W bulb as shown.

   (b) Turn the ignition switch to ON. Check that the bulb is lit and the gauge pointer deflects.

   If indications are not correct, remove and test the oil pressure gauge.



2. TEST OF OIL PRESSURE GAUGE

   Using an ohmmeter, measure the resistance between terminals A and B.

   Resistance: 42 ohms

   If the resistance is not correct, replace the oil pressure gauge.

INSTALLATION OF VOLTMETER AND OIL PRESSURE GAUGE UNIT
(See illustration on page 17-25)

1. INSTALL VOLTMETER AND OIL PRESSURE GAUGE UNIT

   (a) Connect two wiring connectors.

   (b) Install the unit with four screws.

2. CONNECT NEGATIVE CABLE TO BATTERY TERMINAL

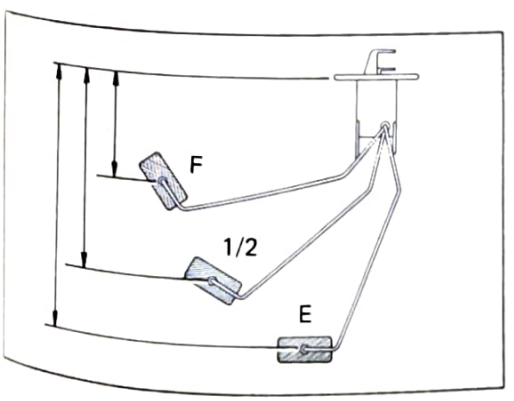
Fuel Sending Unit

1. REMOVE FUEL SENDING UNIT **(See page 17-6 for location)**

2. MEASURE RESISTANCE OF FUEL SENDING UNIT

   Using an ohmmeter, measure the resistance between the terminal and sending unit body for each float position.

   If resistance is not within specification, replace the fuel sending unit.



mm (in.)

Float position	30 series	40 series	Resistance (ohms)
F	102.6 (4.039)	104.6 (4.118)	3 ± 2.1
1/2	179.4 (7.063)	191.3 (7.531)	32.5 ± 4.8
E	258.3 (10.169)	288.3 (11.350)	100 ± 7.7

Water Temperature Sending Unit

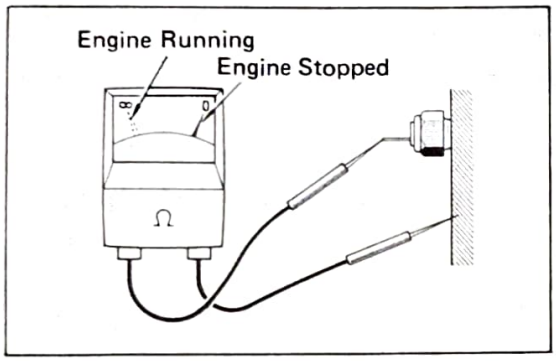
(See page 17-4 for location)

MEASURE RESISTANCE OF WATER TEMPERATURE SENDING UNIT

Water temperature °C (°F)	Resistance (ohms)
50 (122)	154
80 (176)	52
100 (212)	27.5
120 (248)	16

Using an ohmmeter, measure the resistance between the terminal and ground for corresponding water temperatures.

If resistance is not correct, replace the water temperature sending unit.



Oil Pressure Warning Switch

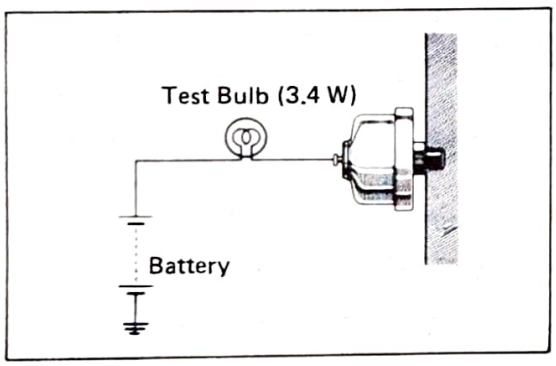
(See page 17-4 for location)

CHECK CONTINUITY OF WARNING SWITCH

(a) Disconnect the connector.

(b) Using an ohmmeter, check continuity between the terminal and ground with engine stopped (at 0 ohm) and with engine running (at infinity).

If not correct, replace the oil pressure warning switch.



Oil Pressure Sending Unit

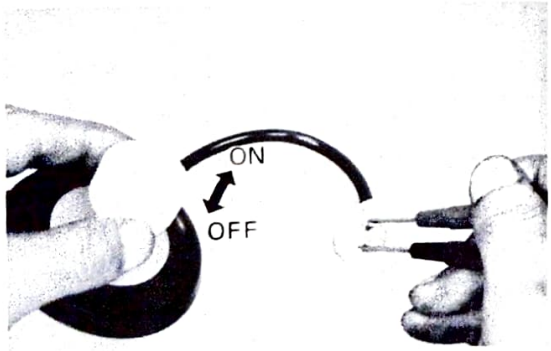
(See page 17-4 for location)

CHECK OIL PRESSURE SENDING UNIT OPERATION

(a) Disconnect the connector from the sending unit.

(b) Connect a 12V battery to the sending unit terminal in series with a 3.4 W bulb. Check that the bulb does not light when the engine is stopped, and flashes when the engine is running. The number of flashes should vary with engine speed.

If checks are not correct, replace the oil pressure sending unit.



Brake Fluid Level Warning Switch

(See page 17-4 for location)

MEASURE RESISTANCE OF WARNING SWITCH

(a) Disconnect the connector.

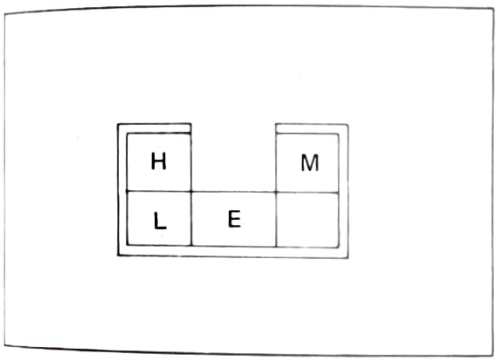
(b) Using an ohmmeter, measure the resistance of the switch when the switch is OFF (float up) and when the switch is ON (float down).

If resistance is not correct, replace the brake fluid level warning switch.

Switch	Float position	Resistance (ohms)
OFF	UP	∞
ON	DOWN	8.2 ± 1

HEATER
Troubleshooting

Problem	Possible cause	Remedy	Page
Blower does not work when fan switch is on	"METER" fuse blown	Replace fuse and check for shorts	
	Heater main relay faulty	Check relay	17-32
	Heater blower switch faulty	Check switch	17-31
	Heater blower resistor faulty	Check resistor	17-31
	Heater blower motor faulty	Replace motor	17-32
	Wiring or ground faulty	Repair as necessary	
Incorrect temperature output	Control cables broken or binding	Check cables	17-33
	Heater hoses leaking or clogged	Replace hose	17-35
	Water valve faulty	Replace valve	17-33
	Air dampers broken	Repair dampers	17-35
	Air ducts clogged	Repair ducts	17-35
	Heater radiator leaking or clogged	Replace radiator	17-35
	Heater control unit faulty	Repair control unit	



Heater Blower Switch

(See page 17-6 for location)

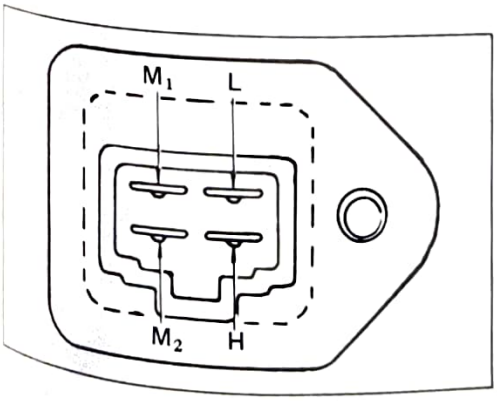
CHECK CONTINUITY OF HEATER BLOWER SWITCH

(a) Disconnect the connector.

(b) Using an ohmmeter, check the continuity of the terminals for each switch position.

If there is no continuity between the switch terminals, replace the heater blower switch.

Switch position \ Terminal (Wire color)	E (WB)	L (LW)	M (LY)	H (LB)
OFF				
•	○—○			
•	○—○	○—○		
HI	○—○	○—○	○—○	



Heater Blower Resistor

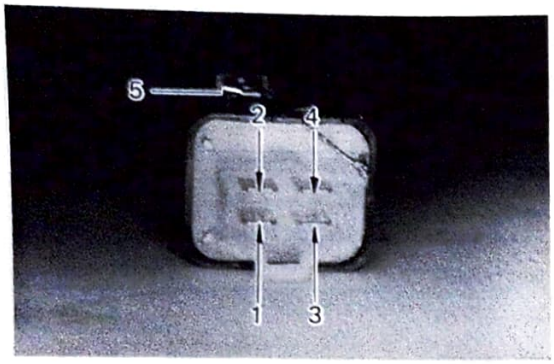
(See page 17-6 for location)

CHECK RESISTANCE OF HEATER BLOWER RESISTOR

(a) Disconnect the wire and remove the blower resistor.

(b) Using an ohmmeter, check the continuity between terminals H and L.

If there is no continuity, replace the heater blower resistor.



Heater Main Relay

(See page 17-6 for location)

CHECK RESISTANCE OF HEATER MAIN RELAY

(a) Remove the heater relay.

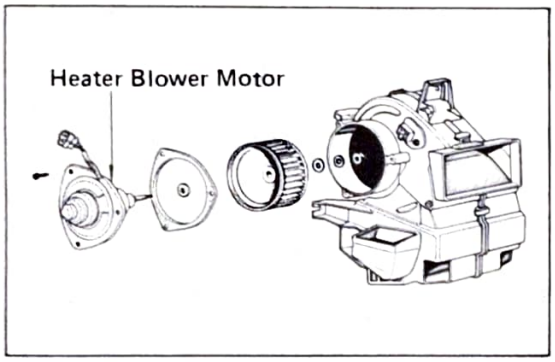
(b) Using an ohmmeter, measure the resistance between terminals 1 and 2.

Resistance: 50 – 80 ohms

(c) Using an ohmmeter, check the continuity between terminals 4 and 5.

Apply 12-volt battery voltage across terminals 1 and 2. Using an ohmmeter, check for continuity between terminals 3 and 4.

If any of the above checks are not correct, replace the heater relay.



Heater Blower Motor

REMOVAL OF HEATER BLOWER MOTOR

1. DISCONNECT BLOWER MOTOR ELECTRICAL CONNECTOR

2. REMOVE BLOWER MOTOR ASSEMBLY

Remove three screws.

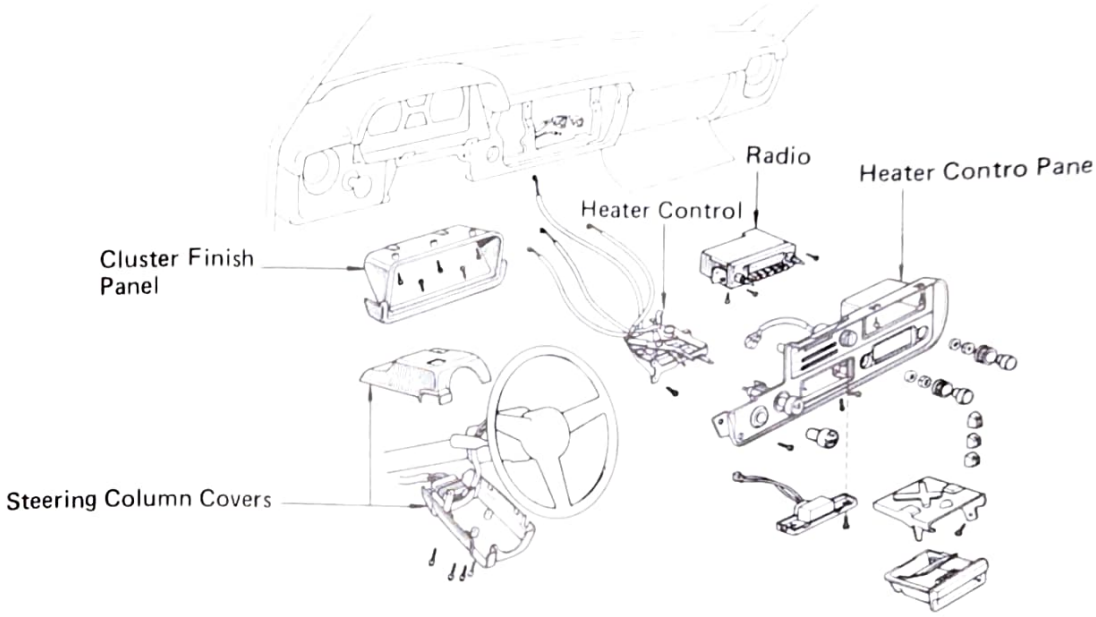
INSTALLATION OF HEATER BLOWER MOTOR ASSEMBLY

1. INSTALL BLOWER MOTOR ASSEMBLY

Install the blower motor assembly, with three screws.

2. CONNECT BLOWER MOTOR ELECTRICAL CONNECTOR

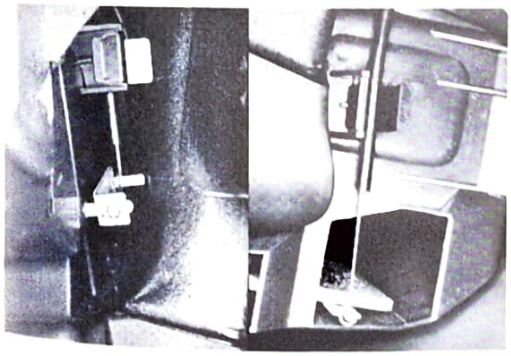
Heater Control



REMOVAL OF HEATER CONTROL

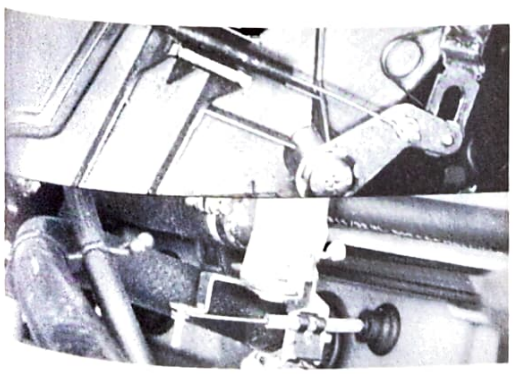
1. DISCONNECT NEGATIVE CABLE FROM BATTERY TERMINAL

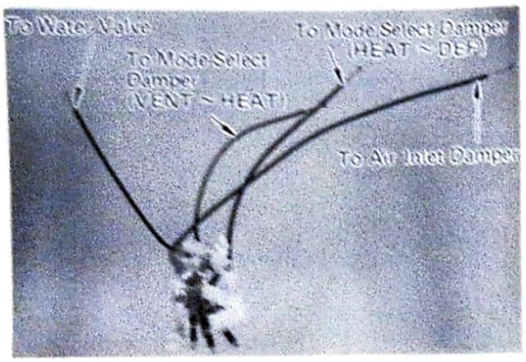
2. REMOVE FOLLOWING PARTS:
   (a) Instrument cluster finish panel.
   (b) Heater control panel.
   (c) Radio.

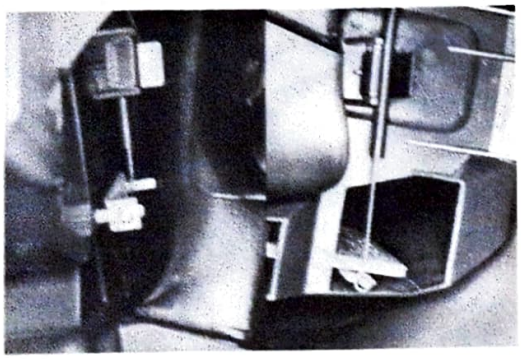


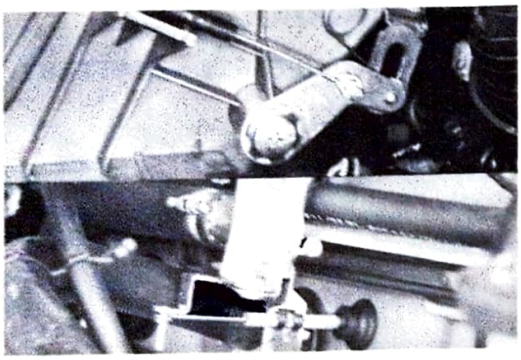
3. DISCONNECT FOUR CONTROL CABLES FROM CLAMPS

4. REMOVE HEATER CONTROL ASSEMBLY
   (a) Remove the control cables.
   (b) Remove the two screws and heater control assembly.







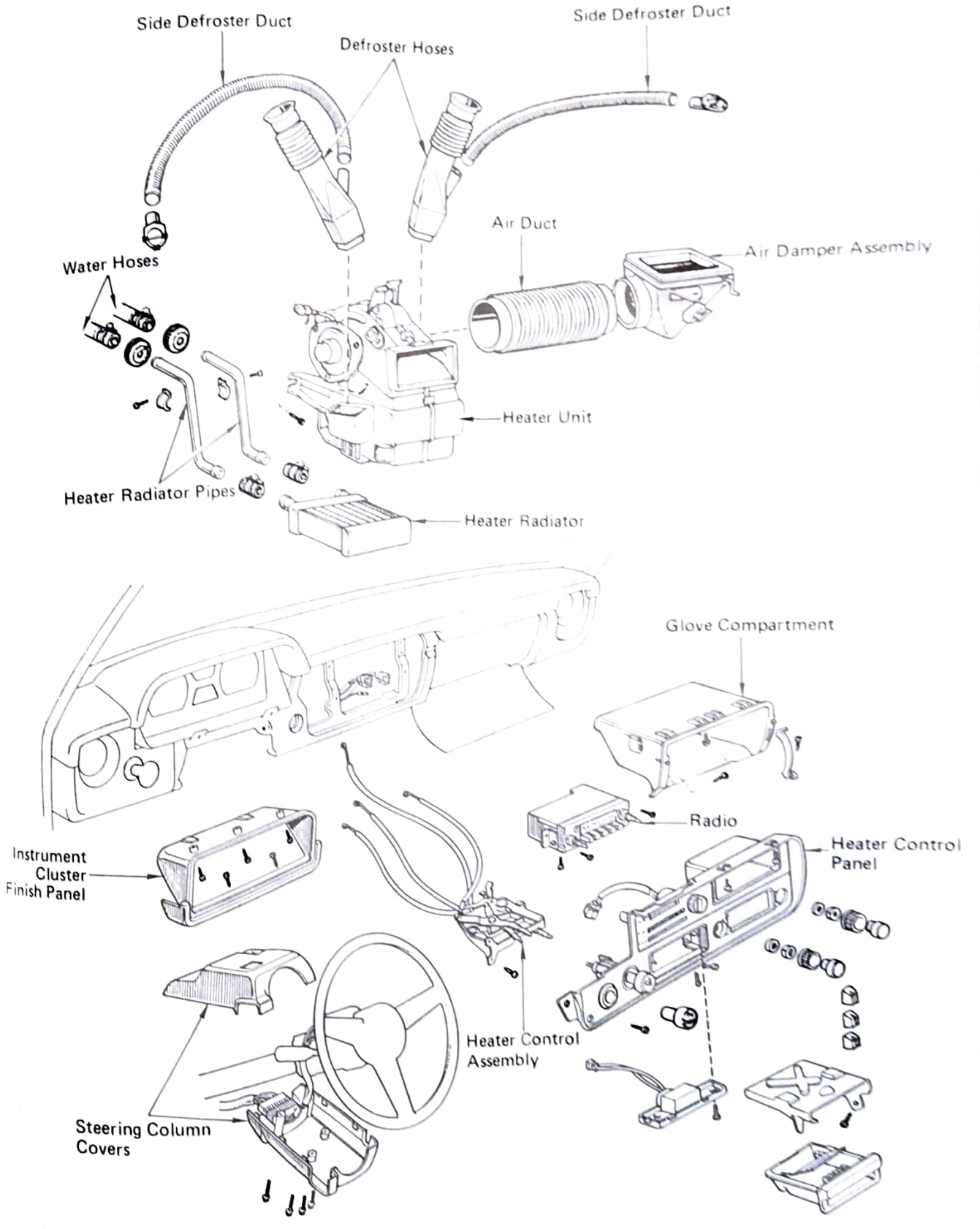


INSTALLATION OF HEATER COTROL

1. CONNECT FOUR CONTROL CABLES TO HEATER CONTROL ASSEMBLY, AS SHOWN
2. INSTALL HEATER CONTROL ASSEMBLY
3. CONNECT FOUR CABLES TO CLAMPS, AS SHOWN
4. TEST CONTROL CABLE OPERATION

   Move the control levers back and forth and check for stiffness, binding and operation through the levers' full range.
5. INSTALL FOLLOWING PARTS:
   (a) Radio
   (b) Heater control panel
   (c) Instrument cluster finish panel
   (d) Steering column covers
6. CONNECT NEGATIVE CABLE TO BATTERY TERMINAL

Heater Unit

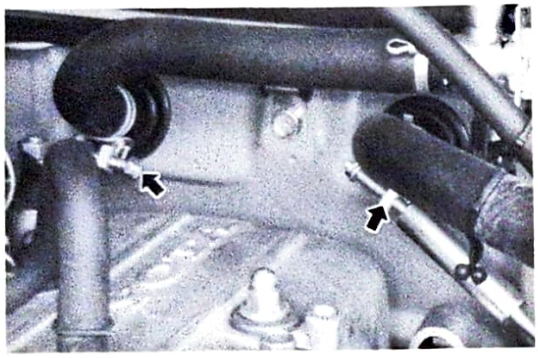

Side Defroster Duct
Defroster Hoses
Side Defroster Duct
Air Duct
Air Damper Assembly
Water Hoses
Heater Unit
Heater Radiator Pipes
Heater Radiator
Glove Compartment
Radio
Heater Control Panel
Instrument Cluster Finish Panel
Heater Control Assembly
Steering Column Covers

REMOVAL OF HEATER UNIT

1. DISCONNECT NEGATIVE CABLE FROM BATTERY TERMINAL

2. OPEN RADIATOR DRAIN COCK AND DRAIN RADIATOR

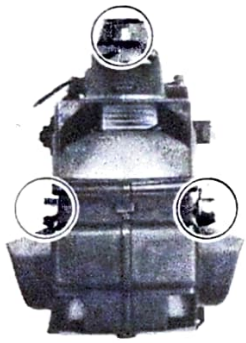
3. REMOVE FOLLOWING PARTS:
   (a) Glove compartment
   (b) Two defroster hoses
   (c) Air damper assembly
   (d) Air duct
   (e) Two side defroster ducts



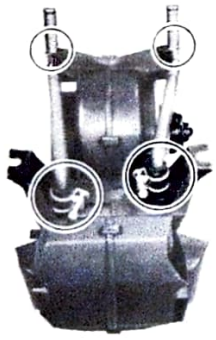
4. REMOVE HEATER CONTROL ASSEMBLY (See steps 2 through 4(a), page 17-33)

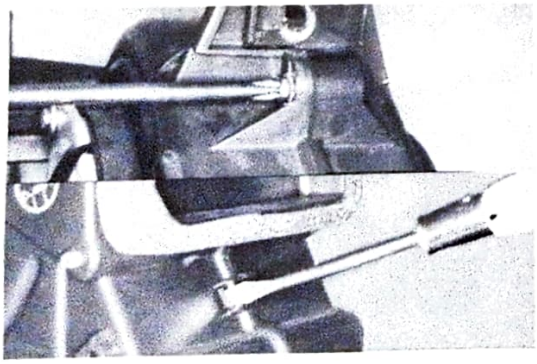
5. DISCONNECT TWO WATER HOSES FROM HEATER RADIATOR PIPES

6. REMOVE HEATER UNIT
   Remove three retaining bolts and the heater unit.

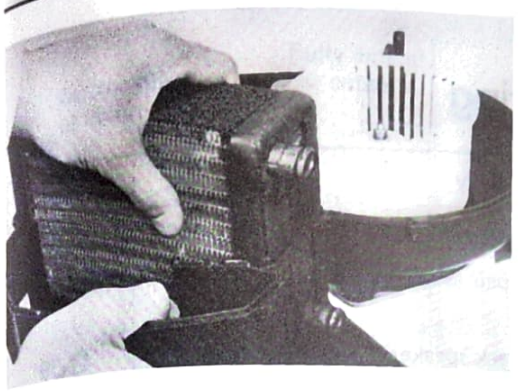


7. PULL OUT RADIATOR FROM HEATER UNIT
   (a) Remove two pipes from the heater radiator.





   (b) Remove the set screw and six clips from the heater unit.



(c) Pull out the heater radiator from the heater unit.

INSTALLATION OF HEATER UNIT
(See illustration on page 17-35)

1. PLACE RADIATOR IN HEATER UNIT
   (a) Install the set screw and six clips to the heater unit.
   (b) Install two pipes to the heater unit radiator.

2. INSTALL HEATER UNIT
   Install the heater unit with three retaining bolts.

3. CONNECT TWO WATER HOSES TO HEATER RADIATOR PIPES

4. INSTALL HEATER CONTROL ASSEMBLY (See steps 2 through 4, page 17-33)

5. INSTALL FOLLOWING PARTS:
   (a) Two side defroster ducts
   (b) Air duct
   (c) Air damper assembly
   (d) Two defroster hoses
   (e) Glove compartment

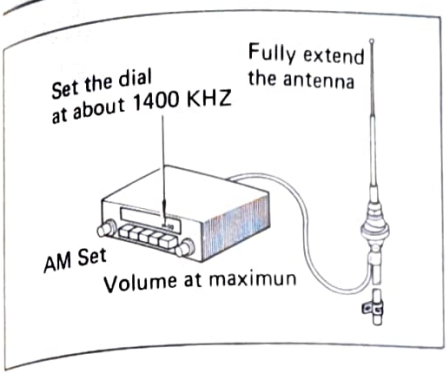
6. CLOSE RADIATOR DRAIN COCK
   Fill the radiator with specified coolant.

7. CONNECT NEGATIVE CABLE TO BATTERY TERMINAL

RADIO

Troubleshooting

Problem	Possible cause	Remedy	Page
Radio dead	"RADIO" fuse blown	Replace fuse and check for short	
	Disconnected or broken speaker, power source or antenna wire	Repair as necessary	
	Speaker faulty	Check speaker	17-39
	Radio faulty	Replace radio	
	Wiring faulty	Repair as necessary	
Static but no AM or FM reception	Disconnected or broken antenna wire	Repair as necessary	
	Antenna faulty	Repair or replace antenna	
	Radio faulty	Replace radio	
Faint reception	Antenna trimmer out of adjustment	Adjust trimmer	17-39
	Antenna faulty	Repair or replace antenna	
	Speaker faulty	Check speaker	17-39
	Radio faulty	Replace radio	
Irregular hum	Speaker damaged	Check speaker	17-39
	Radio faulty	Replace radio	

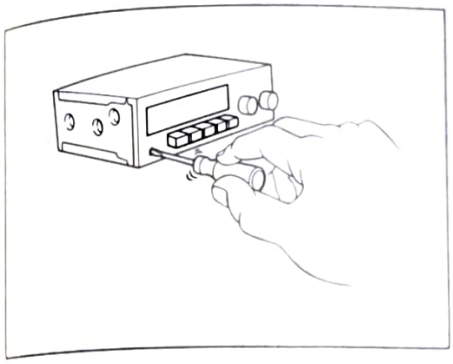


ADJUSTMENT OF RADIO

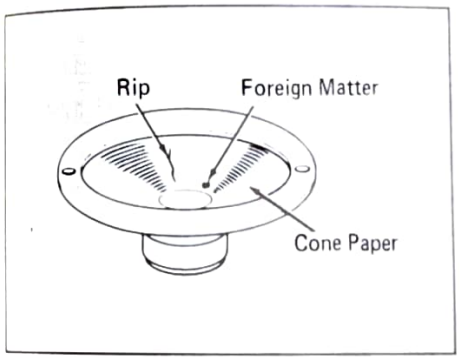
ADJUST ANTENNA TRIMMER FOR PROPER AM RECEPTION

(a) Fully extend the antenna.

(b) Set the dial at about 1,400 KHz. Set the volume at maximum.

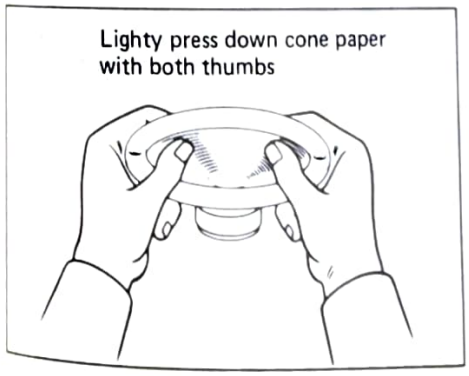


(c) Adjust the antenna trimmer so that the radio hum is highest.



INSPECTION OF RADIO SPEAKER

1. INSPECT CONE PAPER FOR RIPS AND FOREIGN MATTER



2. CHECK VOICE COIL AND MAGNET CONTACT

Lightly press down on the cone paper with both thumbs.

If coil separates, replace the speaker.

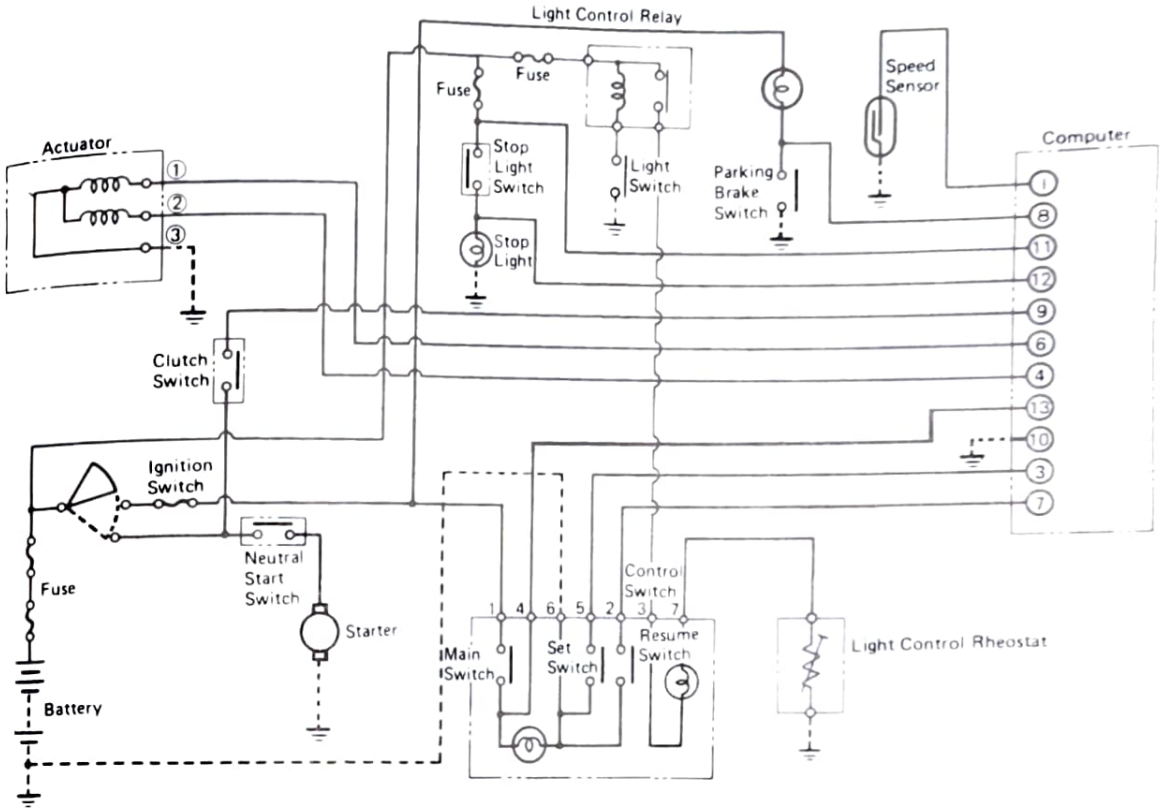
CRUISE CONTROL

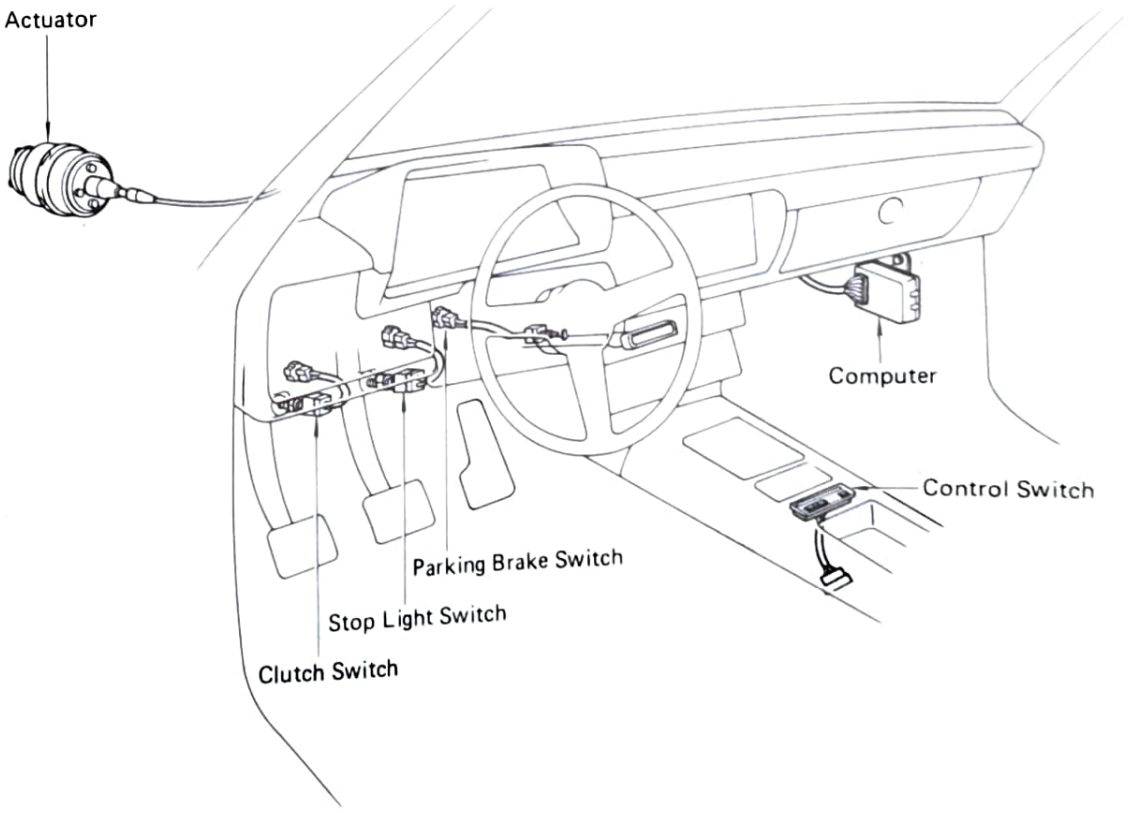
Troubleshooting

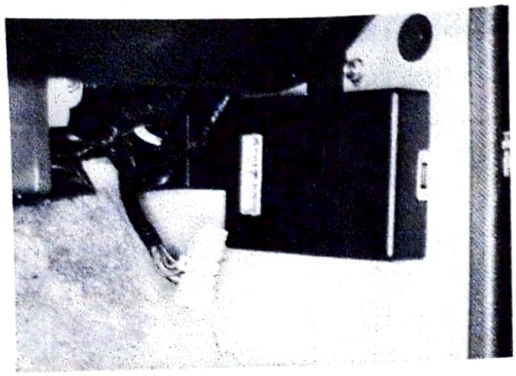
Problem	Possible cause	Remedy	Page
Cruise control cannot be set	METER and STOP fuse blown	Replace fuse and check for short	
	Control Main switch faulty	Check control switch	17-46
Does not cancel even when cancel operation is performed	Parking switch faulty	Check parking switch	17-44
	Speed sensor faulty	Check speed sensor	17-45
	Stop light switch faulty	Check stop light switch	17-44
Cannot be restored with resume switch	Clutch switch faulty	Check clutch switch	17-44
	Actuator faulty	Check actuator	17-45
	Control set switch faulty	Check control switch	17-46
	Control resume switch faulty	Check control switch	17-46
	Computer faulty	Replace computer	17-42
	Wiring or ground faulty	Repair as necessarly	
Warning light does not light	METER fuse blown	Replace fuse and check for short	
	Light bulb burned out	Replace bulb	17-46
	Main switch faulty	Check control switch	17-46
Cannot obtain disired speed	Actuator faulty	Check actuator	17-45
	Computer faulty	Replace computer	17-42
Hunting occurs between acceleration and deceleration when control is set	Carburetor Problem • Sticky throttle valve • Link does not move smoothly • Throttle return is defective • Wrong return spring	Perform on-vehicle inspection of carburetor	
Speed is greatly reduced when ascending slopes	Actuator faulty	Check actuator	17-45
	Computer faulty	Replace computer	17-42

CRUISE CONTROL SYSTEM

WIRING DIAGRAM & LOCATION





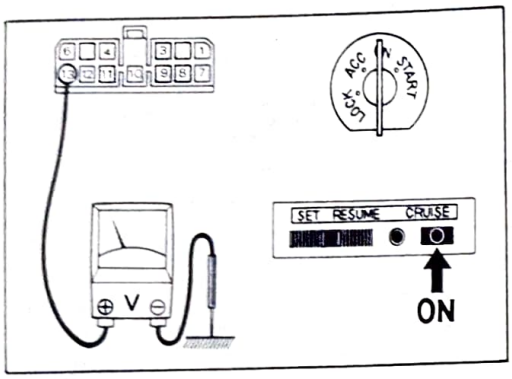


INSPECTION OF COMPUTER AND SENSOR

On-Vehicle Inspection

1. UNPLUG WIRING CONNECTOR FROM COMPUTER
2. INSPECT COMPUTER AT CONNECTOR ON WIRE HARNESS SIDE

(a) Ignition switch "ON".

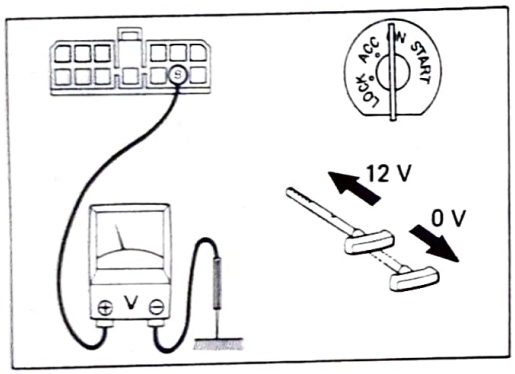


(b) Using voltmeter, measure the voltage between terminal 13 and body ground, with the main switch "ON".

Voltage: Battery voltage

If there is no voltage, check the control switch (see page 17-46).

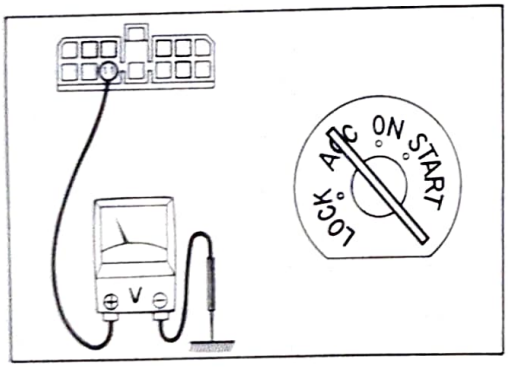
(c) Start the engine.



(d) Using a voltmeter, measure the voltage between terminal 8 and body ground.

When the parking brake lever is pulled: 0 V
When the parking brake lever is returned: 12 V

If the voltage is not correct, check the parking brake switch (see page 17-44).

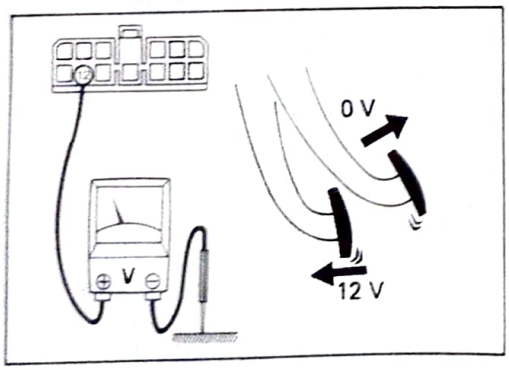


(e) Turn the ignition switch "OFF".

(f) Using a voltmeter, measure the voltage between terminal 11 and body ground.

Voltage: Battery voltage

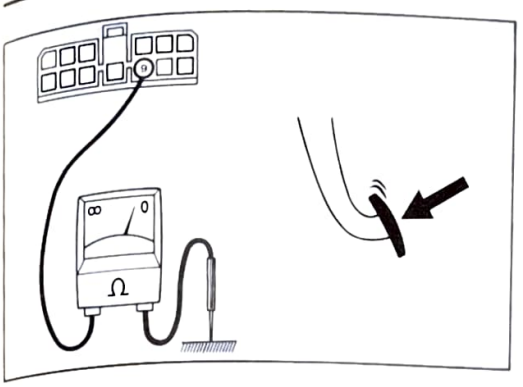
If there is no voltage, check the stop light switch fuse.



(g) Using a voltmeter, measure the voltage between terminal 12 and body groung.

When brake pedal is depressed: 12 V
When brake pedal is returned: 0 V

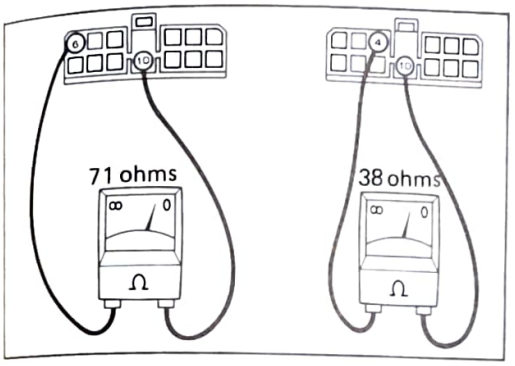
If the voltage is not correct, check the brake pedal switch (see page 17-44).



(h) Using an ohmmeter, check the continuity between terminal 9 and body ground.

When clutch pedal depressed: 0Ω

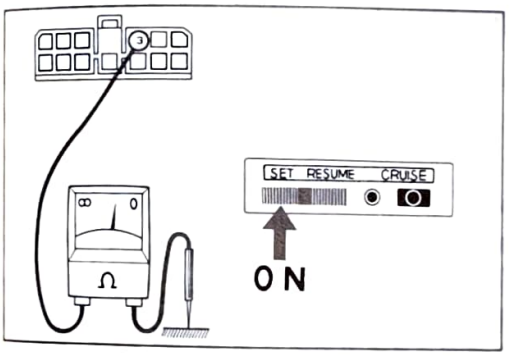
If there is no continuity between the terminals specified, check the clutch switch (see page 17-44).



(i) Using an ohmmeter, measure the resistance between terminals:

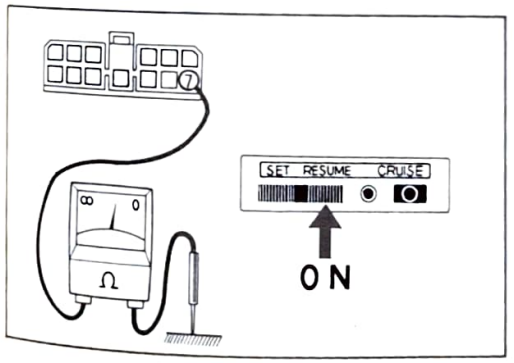
Resistance:	6 – 10	About 71 ohms
	4 – 10	About 38 ohms

If the ohms are not correct, check the actuater (see page 17-45).



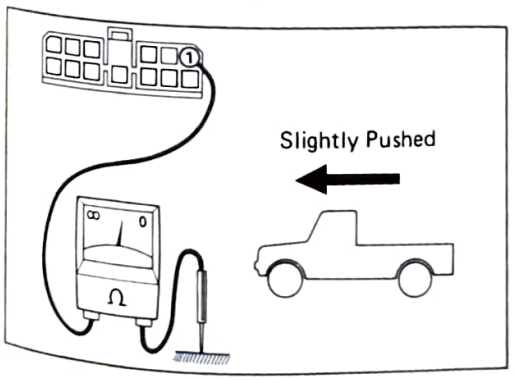
(j) Using an ohmmeter, check the continuity between terminal 3 and body ground when the set switch is turned "ON".

If there is no continuity between the terminal specified, check the control switch (see page 17-46).



(k) Using an ohmmeter, check the continuity between terminal 7 and body, ground when the set switch is turned "ON".

If there is no continuity between the terminals specified, check the control switch (see page 17-46).

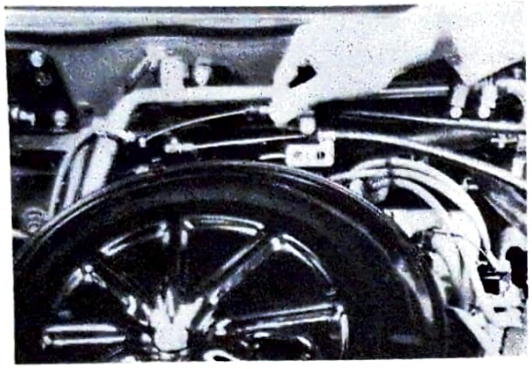


(l) Using an ohmmeter, check the continuity between terminal 1 and body ground when the vehicle is slightly pushed.

At this time, the ohmmeter needle should repeatedly move from "ON" to "OFF".

If the ohmmeter needle does not deflect, check the speed sensor (see page 17-46).

3. **IF ALL OF ABOVE CHECKS ARE CORRECT, REPLACE COMPUTER**



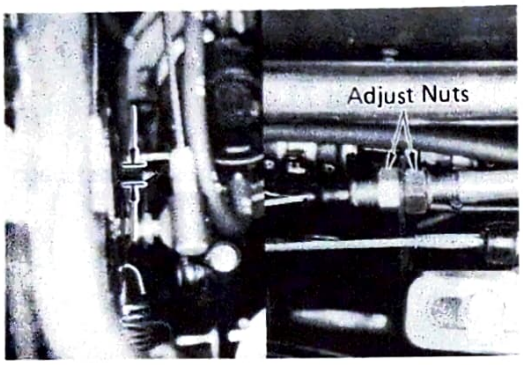
ADJUSTMENT OF CRUISE CONTROL WIRE

NOTE: Confirm that the engine is at normal operating temperature.

1. DISCONNECT CRUISE CONTROL WIRE BELL CRANK FROM BRACKET

2. CONFIRM CORRECT IDLE SPEED

If the idle speed is not correct, adjust (see page 2-9).



3. CONNECT CRUISE CONTROL WIRE

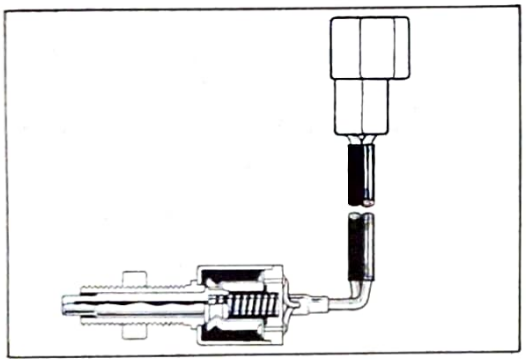
(a) Check that engine rpm does not rise.

(b) Adjust as shown in the figure.

Clearance: About 5 mm (0.20 in.)

COMPONENT INSPECTION

Stop Switch



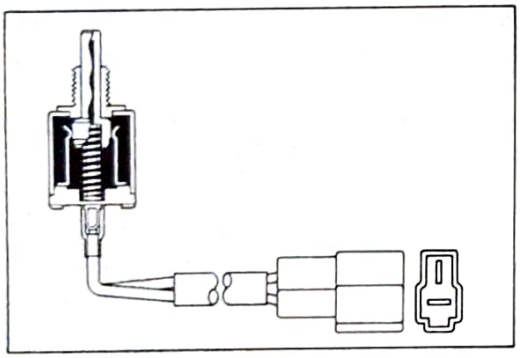
1. DISCONNECT LEAD WIRES

2. CHECK STOP SWITCH

Using an ohmmeter, check the continuity between both terminals when the brake pedal is depressed.

If there is no continuity, replace stop switch.

Parking Brake Switch



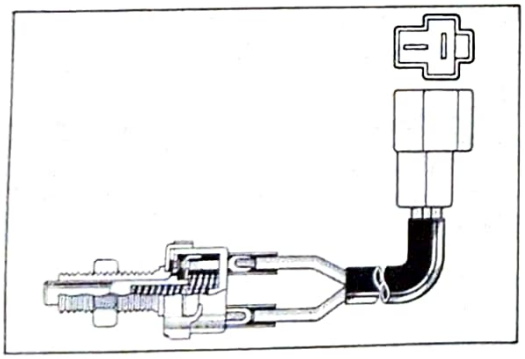
1. DISCONNECT LEAD WIRES

2. CHECK CLUTCH SWITCH

Using an ohmmeter, check the continuity between both terminals when the parking brake pedal is depressed.

If there is no continuity, replace parking brake switch.

Clutch Switch

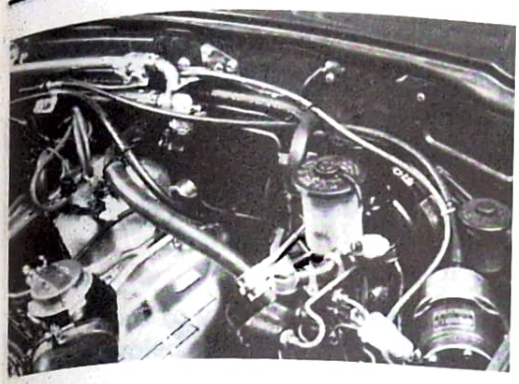


1. DISCONNECT LEAD WIRES

2. CHECK CLUTCH SWITCH

Using an ohmmeter, check the continuity between both terminals when the clutch pedal is depressed.

If there is no continuity, replace clutch switch.



ACTUATER

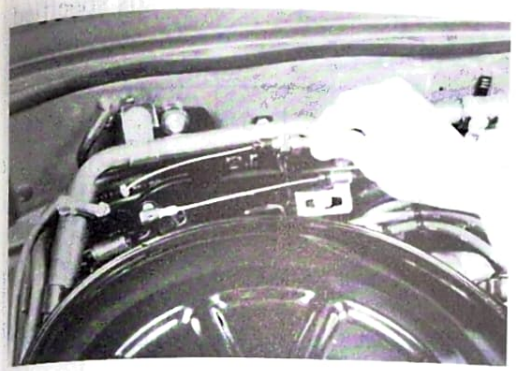
1. DISCONNECT CONNECTOR FROM ACTUATER LEAD WIRE

2. CHECK ACTUATER RESISTANCE

Using an ohmmeter, measure the resistance between the terminals for 1 – 3 and 2 – 3.

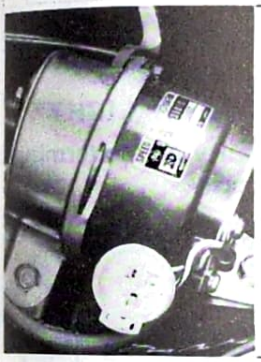
Resistance: 1 – 3 About 71 ohms
2 – 3 About 38 ohms

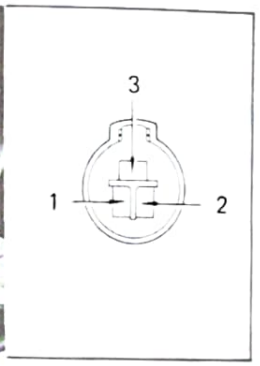
If the resistance is not correct, replace the actuater.



3. DISCONNECT CARBURETOR THROTTLE CABLE FROM BELL CRANK

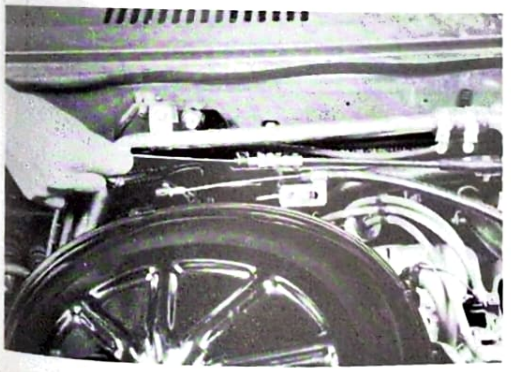
4. START ENGINE





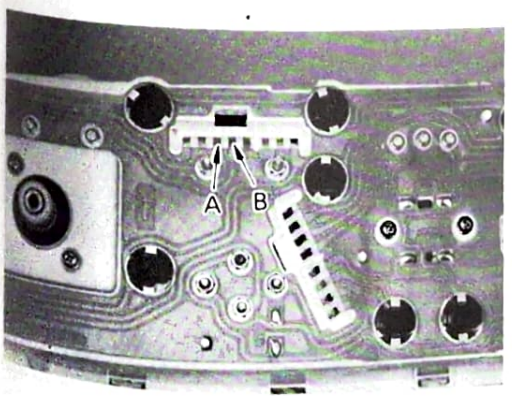
5. CHECK ACTUATOR OPERATION

(a) Check that the diaphragm makes a smooth reciprocating motion when either power is applied to terminals 1 and 2 with actuator terminal 3 grounded to the body or, subsequently, power is removed from only terminal 2.



(b) Confirm that the cable does not return easily when pulled with 2 – 3 kg (4 – 7 lb) of force.

If the operation is not correct, replace the actuater.



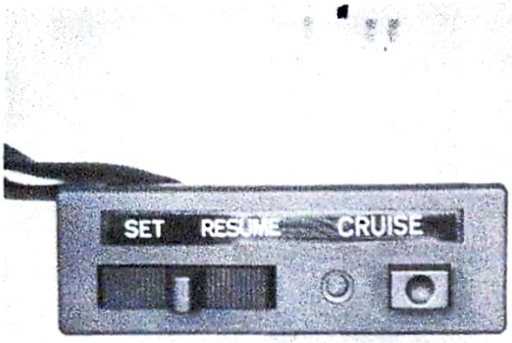
Speed Sensor

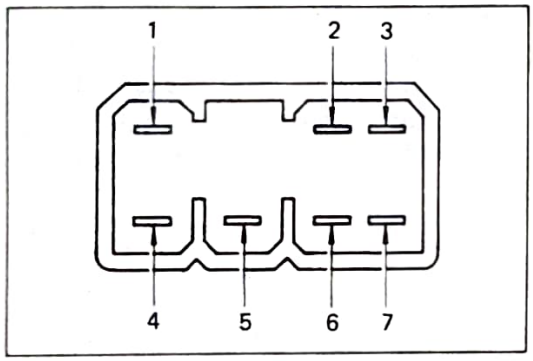
1. REMOVE COMBINATION METER ASSEMBLY

2. CHECK SPEED SENSOR

Using an ohmmeter, check to see that there is continuity between terminals A and B four times per each revolution of the magnet shaft.

If there is no continuity between the terminals specified, replace the speed sensor.





Control Switch

1. REMOVE SHIFT LEVER KNOB
2. REMOVE CONSOLE BOX
3. REMOVE CONTROL SWITCH
4. CHECK CONTROL SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position shown in the table below.

If there is no continuity between the terminals specified, replace the switch.

Switch position \ Terminal		1	4	6	5	2	3	7
Main switch	ON	○	○					
	OFF							
Control switch	SET			○	○			
	OFF							
	RESUME			○		○		

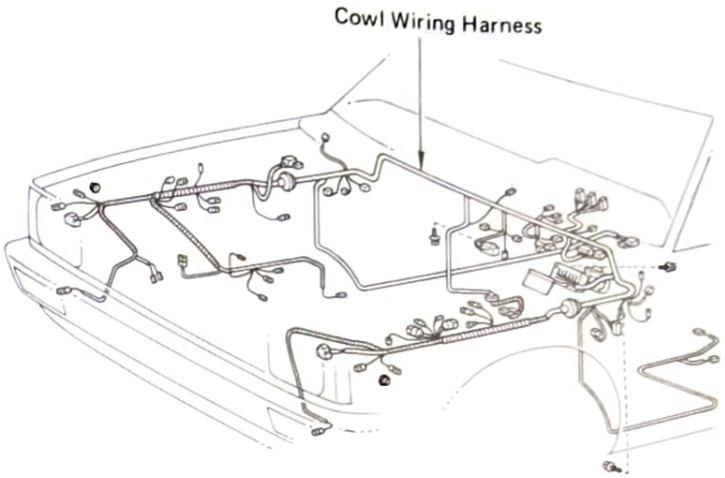
5. CHECK WARNING LIGHT AND SWITCH LIGHT

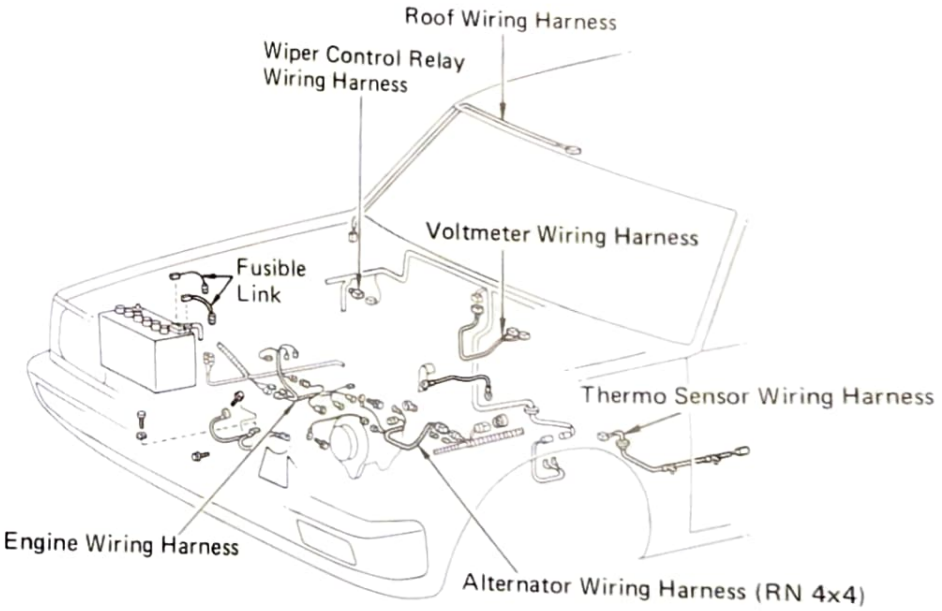
Using an ohmmeter, check the continuity of the terminals for each position shown in the table below.

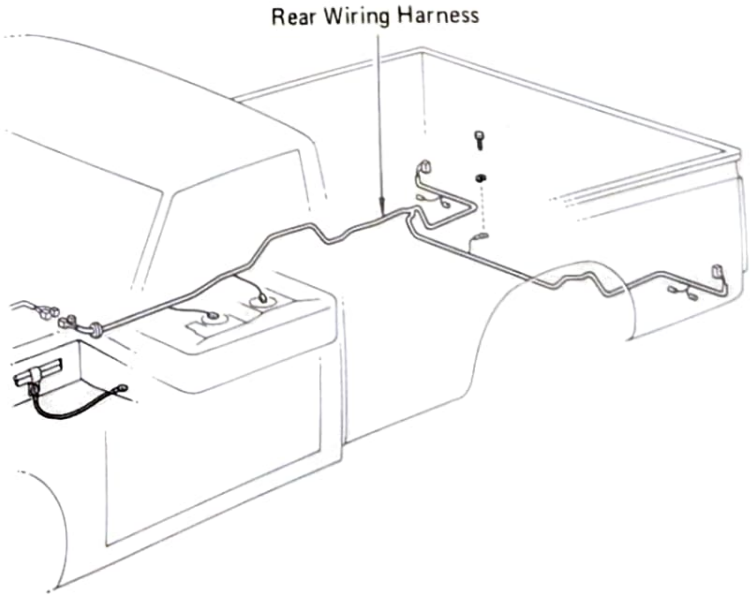
If there is no continuity between the terminals specified, replace the bulb.

Terminal	1	4	6	5	2	3	7
Warning light		○	○				
Switch light						○	○

WIRING HARNESS ROUTING







– MEMO –

BODY AND INTERIOR

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DOOR	18-11
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SEAT (Bench Type)	18-28
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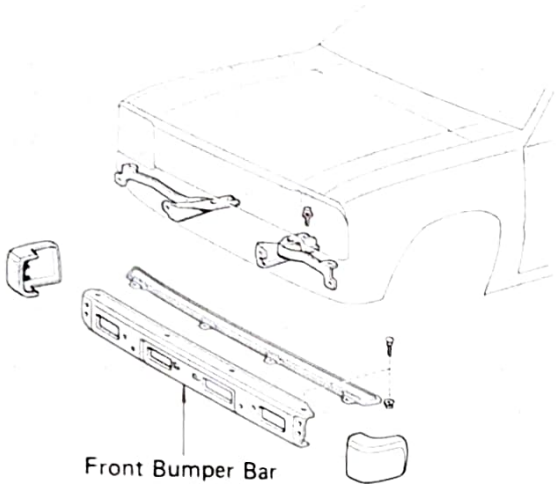
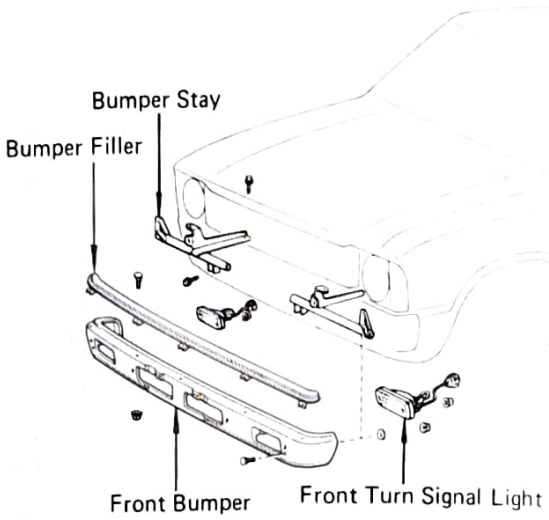
BODY DIMENSIONS (RN4x2)	18-31
BODY DIMENSIONS (RN4x4)	18-32

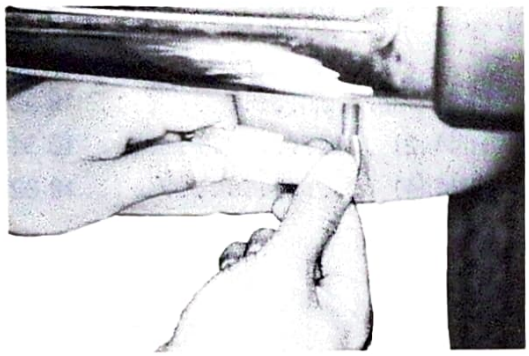
FRONT BUMPER

RN4x2



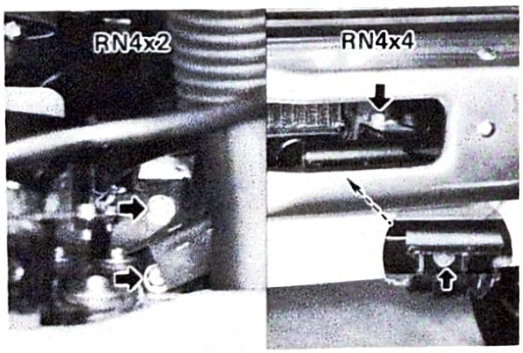
RN4x4





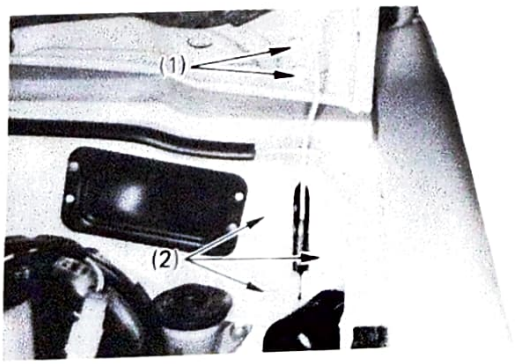
REMOVAL OF FRONT BUMPER

1. DISCONNECT TWO FRONT TURN SIGNAL LIGHT CONNECTORS
2. REMOVE FOLLOWING PARTS:
   (a) Front bumper assembly
   (b) Bumper stay
   (c) Front turn signal light
   (d) Bumper filler
   (e) Bumper extension



INSTALLATION OF FRONT BUMPER

1. INSTALL FOLLOWING PARTS:
   (a) Bumper extension
   (b) Bumper filler
   (c) Front turn signal light
   (d) Bumper stay
   (e) Front bumper assembly
2. CONNECT TWO FRONT TURN SIGNAL LIGHT CONNECTORS

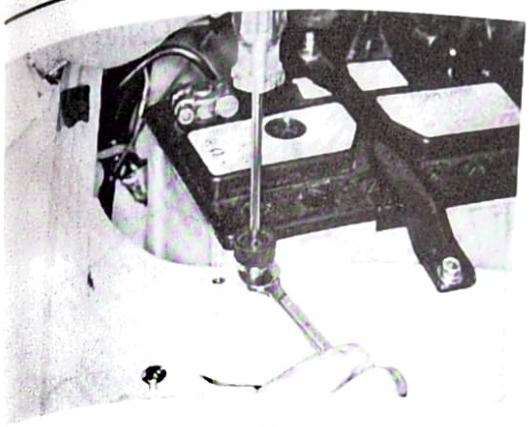


HOOD

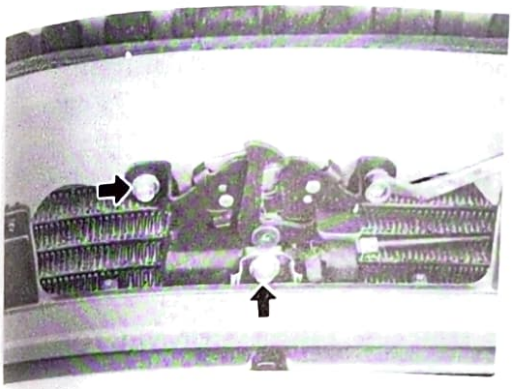
ADJUSTMENT OF HOOD

(a) For forward/rearward and left/right adjustment loosen bolts (1).

(b) For vertical adjustment of rear edge of hood, loosen bolts (2).



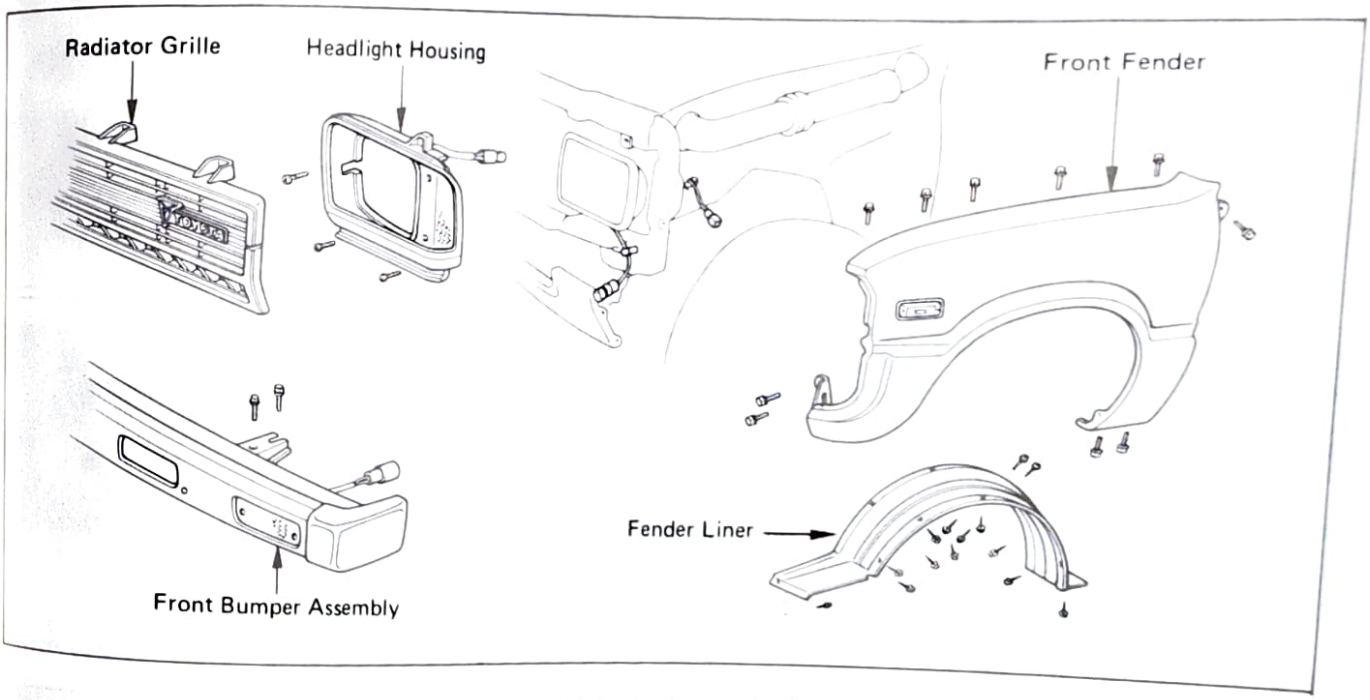
(c) For vertical adjustment of front edge of hood, turn cushion.



ADJUSTMENT OF HOOD LOCK

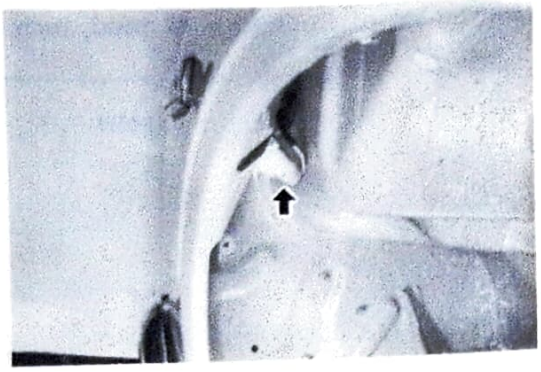
ADJUST HOOD LOCK BY LOOSENING MOUNTING BOLTS

FRONT FENDER

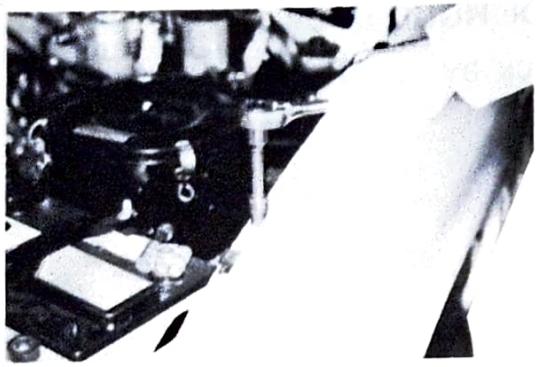


REMOVAL OF FRONT FENDER

1. REMOVE FOLLOWING PARTS:
   (a) Front bumper assembly (See page 18-2)
   (b) Headlight housing
   (c) Fender liner



2. DISCONNECT SIDE MARKER LIGHT CONNECTOR



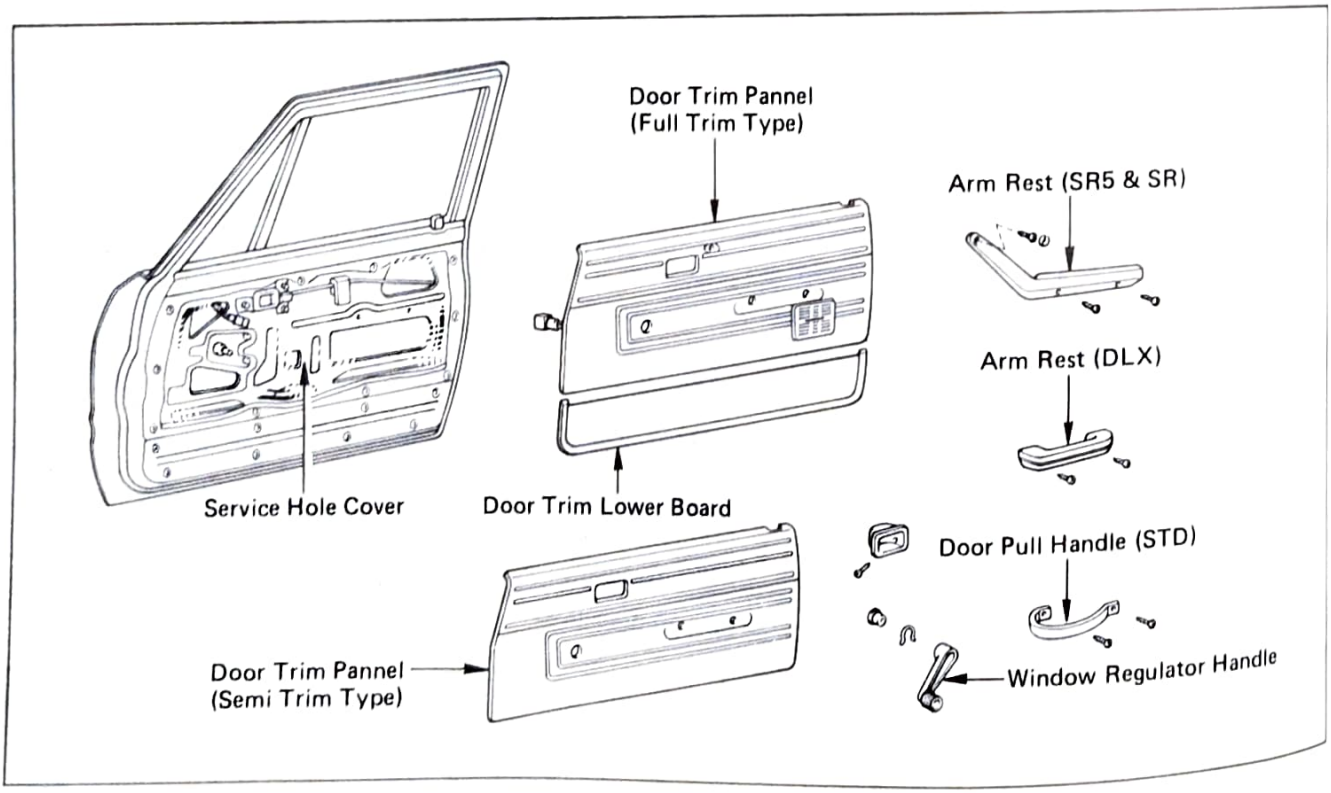
3. REMOVE FRONT FENDER

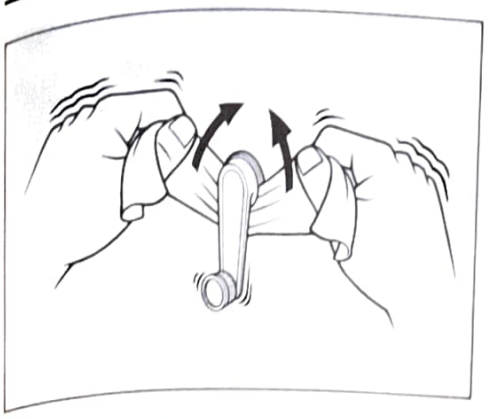
Remove fender mounting bolts and fender.

INSTALLATION OF FRONT FENDER

1. INSTALL FRONT FENDER WITH MOUNTING BOLTS
2. CONNECT SIDE MARKER LIGHT CONNECTOR
3. INSTALL FOLLOWING PARTS:
   (a) Fender liner
   (b) Headlight housing
   (c) Radiator grille
   (d) Front bumper assembly (See page 18-2)

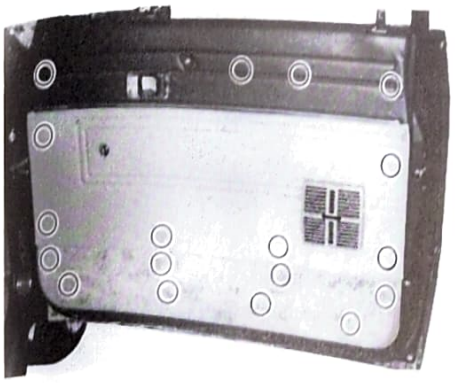
DOOR TRIM



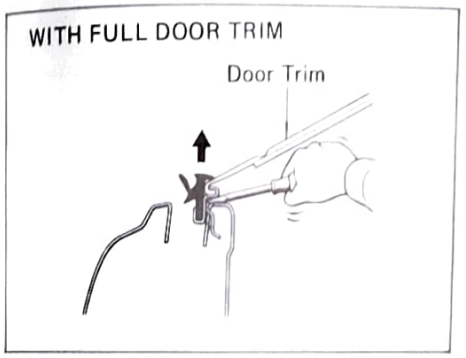


REMOVAL OF DOOR TRIM

1. REMOVE FOLLOWING PARTS:
   (a) Door inside handle bezel
   (b) Arm rest
2. REMOVE WINDOW REGULATOR HANDLE
   Remove the snap ring with a cloth.



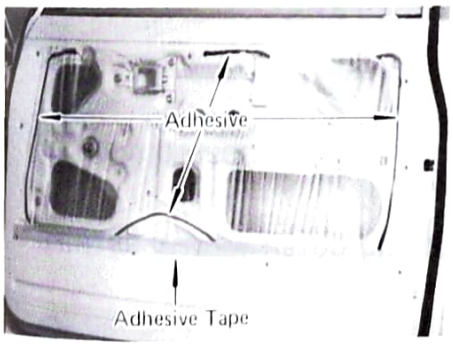
3. REMOVE DOOR TRIM
   (a) Insert a screwdriver between the retainers and the door panel to pry it loose.



   (b) With full door trim – Pull up the trim and, using a screwdriver, remove it from the weatherstrip clips beginning from the front and working toward the rear.

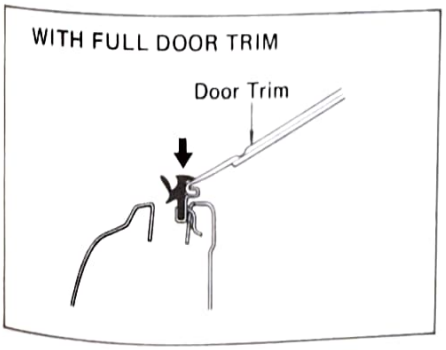
   NOTE: Be careful not to scratch the door panel.

   (c) Peel off the outer ridges of the service hole cover.

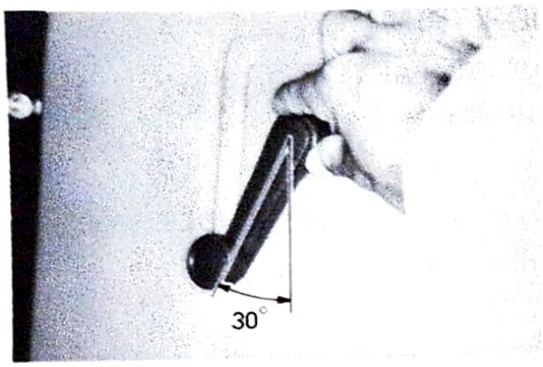


INSTALLATION OF DOOR TRIM

1. INSTALL SERVICE HOLE COVER
   Insert the lower end of the service hole cover into the slot. Apply adhesive and tape as shown.



2. INSTALL DOOR TRIM
   With full door trim –
   (a) Observing from above, securely insert the weatherstrip clips into the door inner panel holes, beginning from the front and working toward the rear.
   (b) Install the door trim retainers so that there are no wrinkles in the upper portion of the door trim.



3. INSTALL WINDOW REGULATOR HANDLE

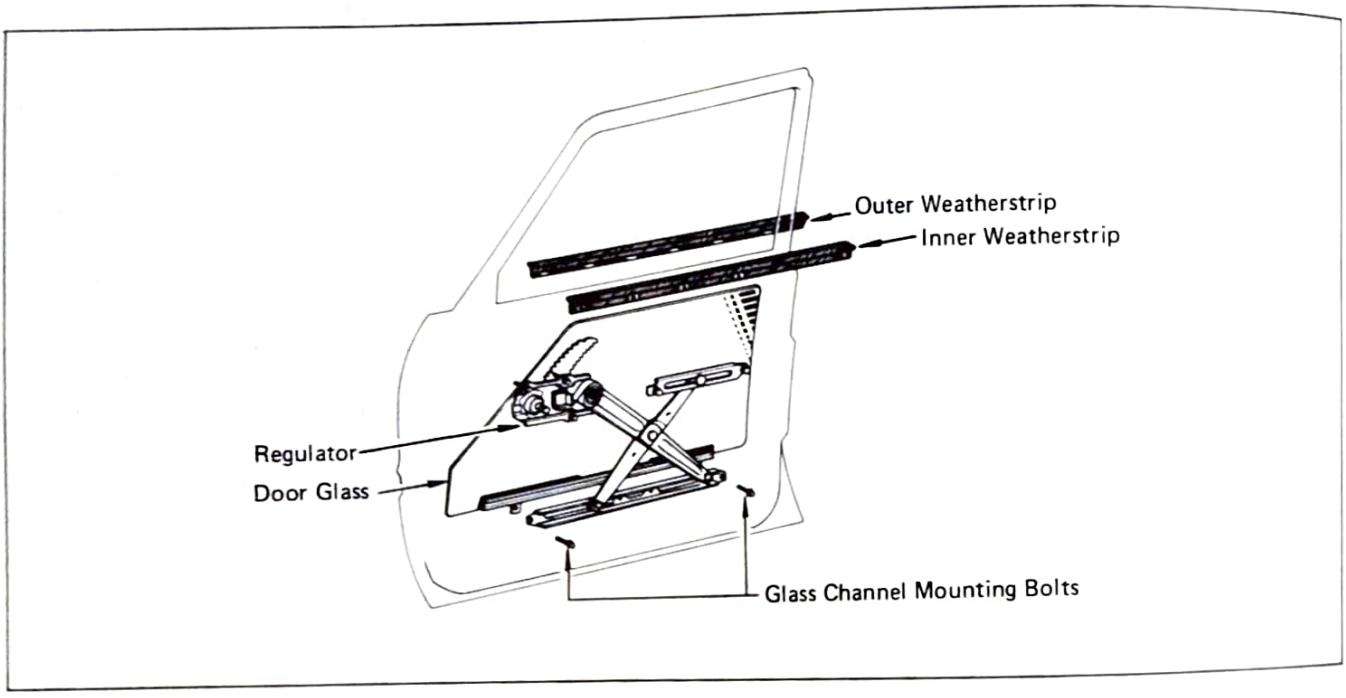
With door window fully closed, install window regulator handle as shown with snap ring.

4. INSTALL FOLLOWING PARTS:

(a) Arm rest

(b) Door inside handle bezel

DOOR GLASS (Without Ventilator Window)

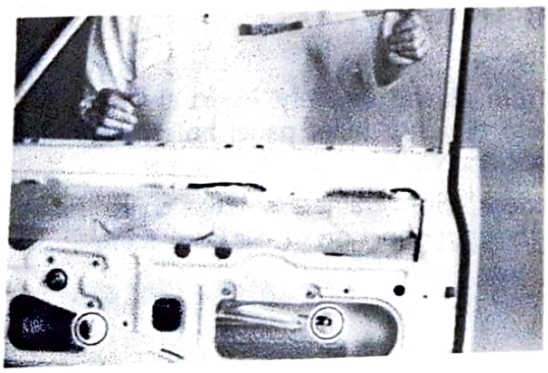


REMOVAL OF DOOR GLASS

1. LOWER WINDOW FULLY

2. REMOVE DOOR TRIM PANEL AND PEEL OFF OUTER RIDGES OF SERVICE HOLE COVER
(See page 18-5)

3. REMOVE INNER AND OUTER WEATHERSTRIPS

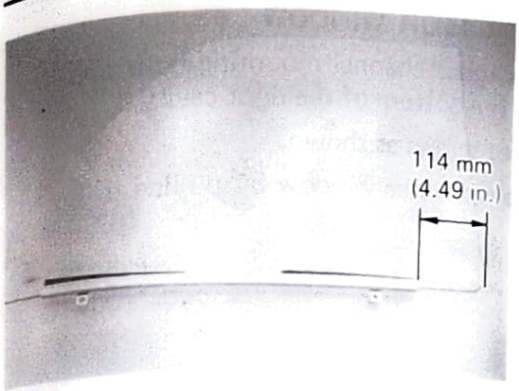


4. REMOVE DOOR GLASS

(a) Remove two glass channel mounting bolts.

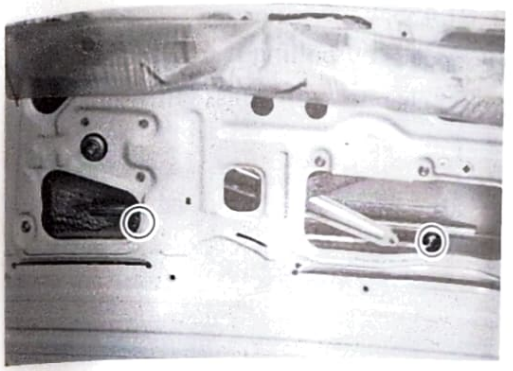
(b) Remove the door glass by pulling it upward.

(c) Remove the glass channel from glass with screwdriver or such.



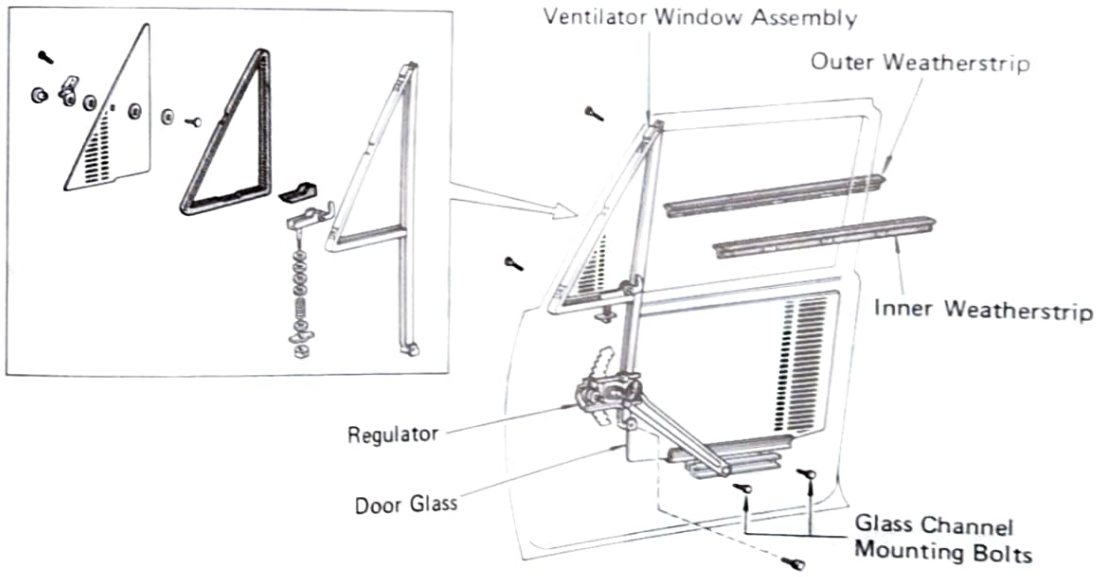
INSTALLATION OF DOOR GLASS

1. INSTALL GLASS CHANNEL ON GLASS
   (a) Apply soapy water to the inside of the weatherstrip.
   (b) Tap the glass channel with plastic hammer.
2. PLACE DOOR GLASS IN DOOR
   Insert the door glass in the door cavity.



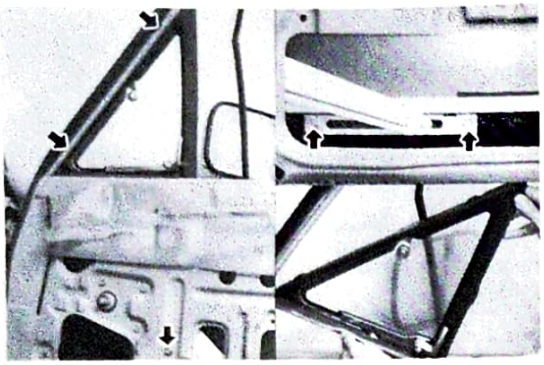
3. INSTALL DOOR GLASS TO WINDOW REGULATOR WITH TWO MOUNTING BOLTS
4. INSTALL INNER AND OUTER WEATHERSTRIPS
5. INSTALL SERVICE HOLE COVER AND DOOR TRIP PANEL (See page 18-5)

DOOR GLASS (With Ventilator Window)

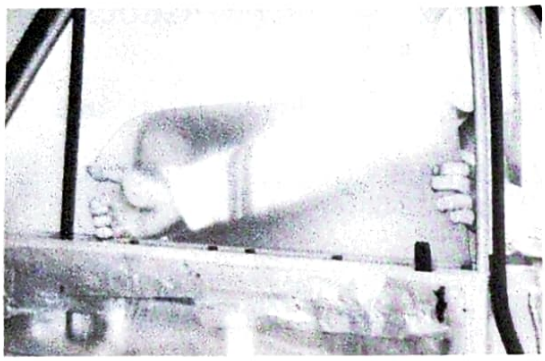


REMOVAL OF DOOR GLASS

1. LOWER WINDOW FULLY
2. REMOVE DOOR TRIM PANEL AND PEEL OFF OUTER RIDGES OF SERVICE HOLE COVER (See page 18-5)
3. REMOVE INNER AND OUTER WEATHERSTRIPS

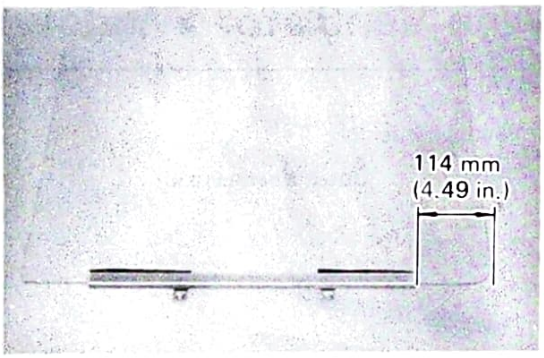


4. REMOVE VENTILATOR WINDOW
   (a) Remove two glass channel mounting bolts and place the glass on the bottom of the door cavity.
   (b) Remove three screws as shown.
   (c) Remove the ventilator window by pulling it upward.



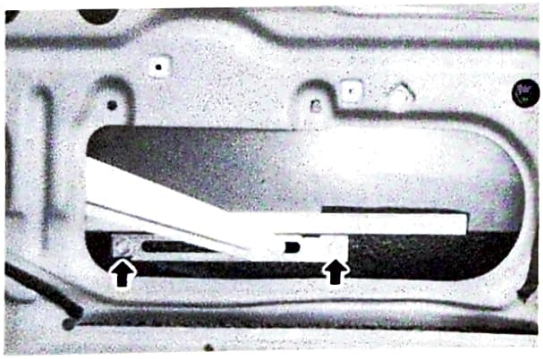
5. REMOVE DOOR GLASS
   (a) Remove the door glass by pulling it upward.
   (b) Remove the glass channel from glass with screwdriver or such.

INSTALLATION OF DOOR GLASS



1. INSTALL GLASS CHANNEL ON GLASS
   (a) Apply soapy water to the inside of the weatherstrip.
   (b) Tap the glass channel with plastic hammer.

2. PLACE DOOR GLASS IN DOOR
   Insert the door glass in the door cavity.

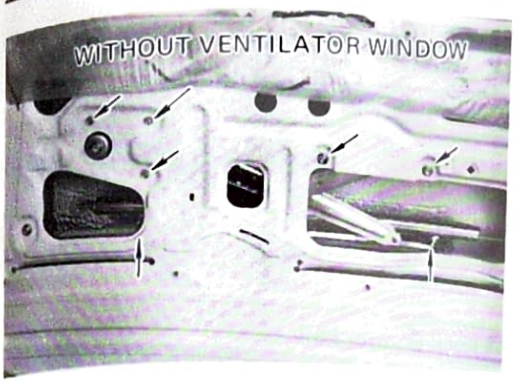


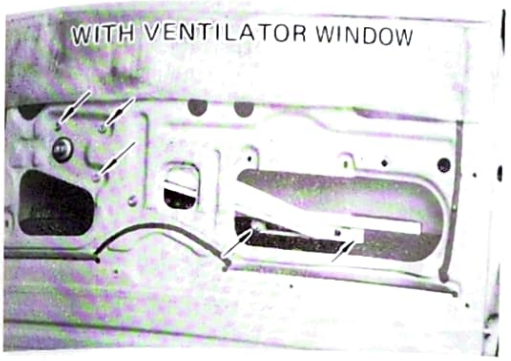
3. INSTALL VENTILATOR WINDOW WITH THREE SCREWS

4. INSTALL DOOR GLASS TO WINDOW REGULATOR WITH TWO MOUNTING BOLTS

5. INSTALL INNER AND OUTER WEATHERSTRIPS

6. INSTALL SERVICE HOLE COVER AND DOOR TRIM PANEL (See page 18-5)





WINDOW REGULATOR

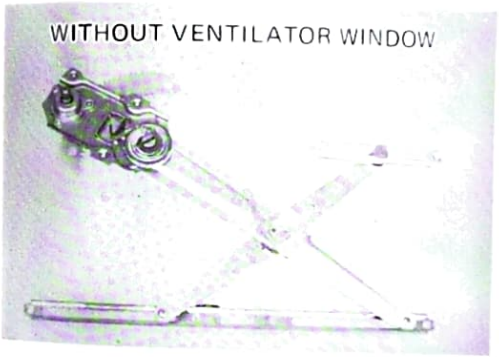
REMOVAL OF WINDOW REGULATOR

1. REMOVE DOOR TRIM PANEL AND PEEL OFF OUTER RIDGES OF SERVICE HOLE COVER
(See page 18-5)

2. REMOVE REGULATOR

(a) Remove two glass channel mounting bolts and support the glass with one hand while removing the regulator mounting bolts with the other hand.

(b) Remove the regulator through the service hole.

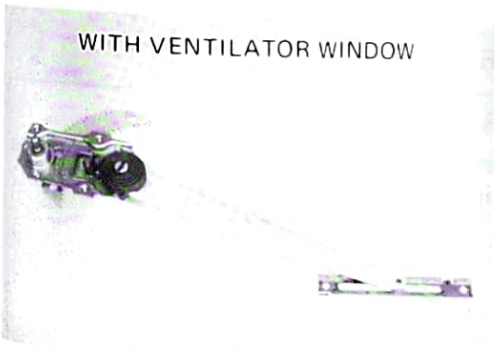


INSPECTION OF WINDOW REGULATOR

(a) Check gears for wear.

(b) Check spring for weakness and good condition.

(c) Lubricate sliding parts.



INSTALLATION OF WINDOW REGULATOR

1. INSTALL REGULATOR WITH MOUNTING BOLTS

Install the regulator in the door through the service hole.

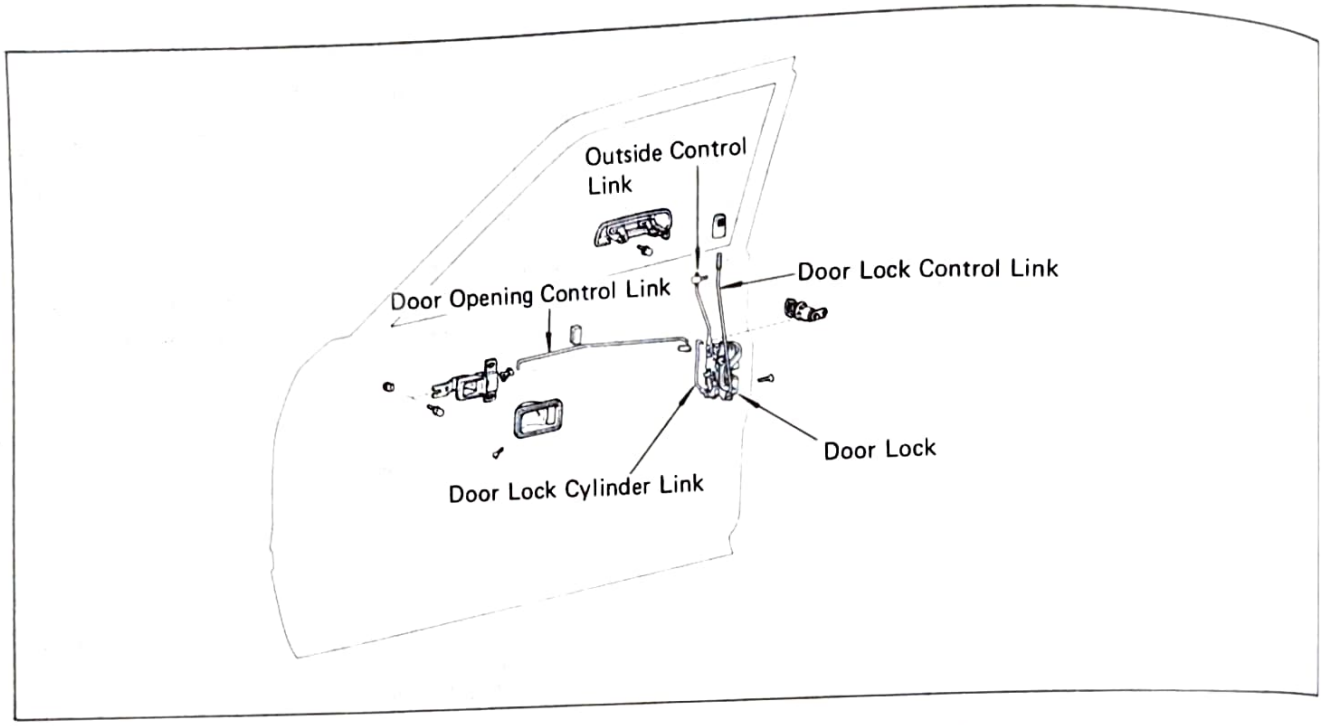
2. INSTALL DOOR GLASS

Without ventilator window (See steps 2 through 4, page 18-6)

With ventilator window (See steps 2 through 5, page 18-7)

3. INSTALL SERVICE HOLE COVER AND DOOR TRIM PANEL (See page 18-5)

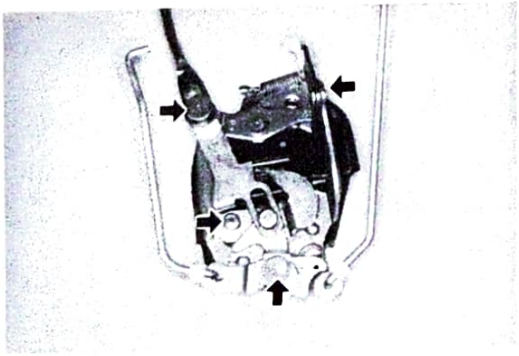
DOOR LOCK



REMOVAL OF DOOR LOCK

1. REMOVE DOOR TRIM PANEL AND PEEL OFF OUTER RIDGES OF SERVICE HOLE COVER
(See page 18-5)

2. DISCONNECT FOLLOWING LINKAGES:
   (a) Door opening control link
   (b) Outside control link
   (c) Door lock control link
   (d) Door lock cylinder link



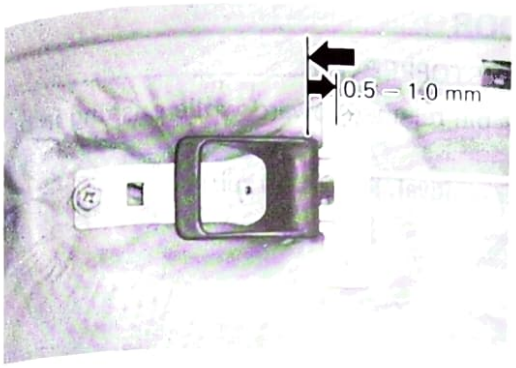
3. REMOVE DOOR LOCK

4. INSPECT DOOR LOCK
   Check the operation of the door lock. Lubricate as required with multipurpose grease.

INSTALLATION OF DOOR LOCK

1. INSTALL DOOR LOCK WITH MOUNTING SCREWS

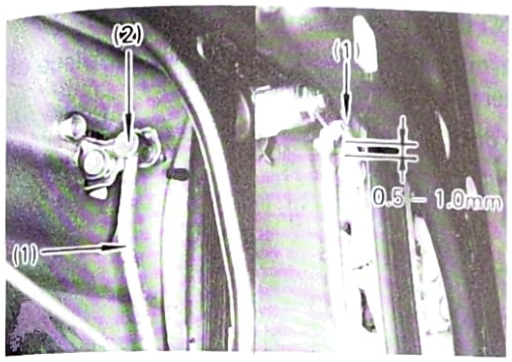
2. CONNECT FOLLOWING LINKAGES:
   (a) Door lock cylinder link
   (b) Door lock control link
   (c) Outside control link
   (d) Door opening control link



3. ADJUST DOOR INSIDE HANDLE

(a) Loosen screws.

(b) Push door handle forward until strong resistance is felt. Move handle back 0.5 – 1.0 mm (0.020 – 0.039 in.) and tighten mounting bolts.

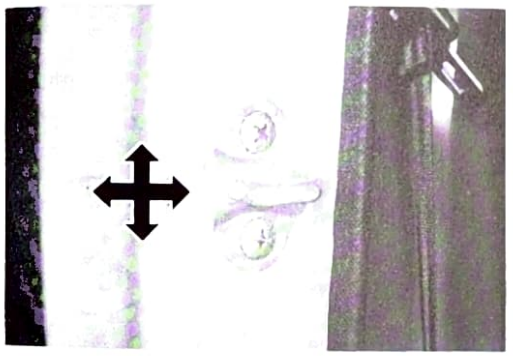


4. ADJUST DOOR OUTSIDE HANDLE

(a) Disconnect control link (1).

(b) Raise handle 0.5 – 1.0 mm (0.020 – 0.039 in.) from the rest position.

(c) Fit the pin into the hole by turning adjuster (2).



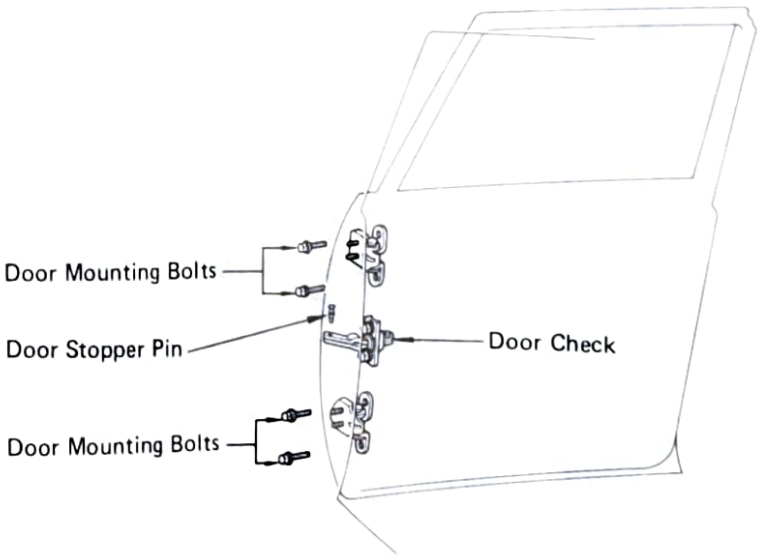
5. ADJUST DOOR LOCK STRIKER

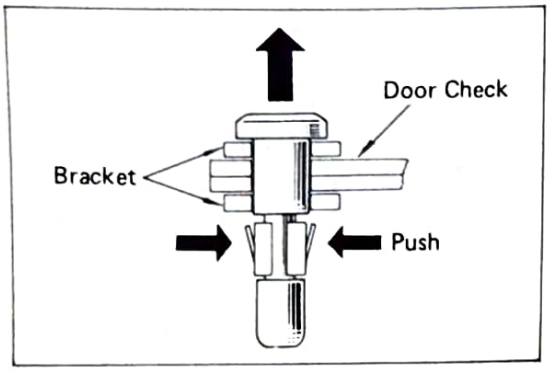
(a) Check that door fit and door lock linkages are adjusted correctly.

(b) Adjust striker by loosening striker mounting screws.

6. INSTALL SERVICE HOLE COVER AND DOOR TRIM PANEL (See page 18-5)

DOOR



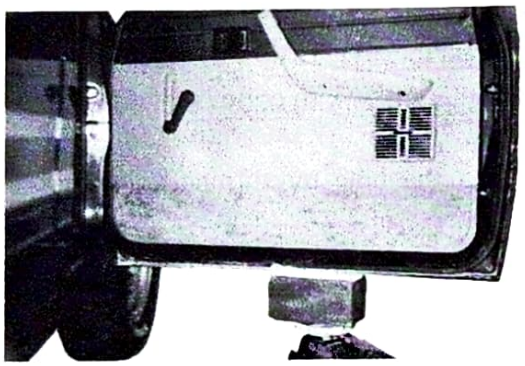


REMOVAL OF DOOR

1. REMOVE DOOR STOPPER PIN

Pull door stopper pin retainer upward while pushing in on the claw.

CAUTION: **After removal, leave claw raised.**



2. REMOVE MOUNTING BOLTS AND DOOR

(a) Support the door panel with a jack with a piece of wood between jack and panel.

(b) Remove the door mounting bolts and door.

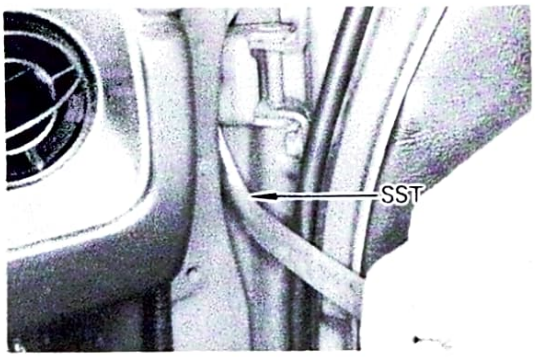
INSTALLATION OF DOOR

1. INSTALL DOOR

(a) Place door on wooden block and jack.

(b) Install door with door mounting bolts.

2. INSTALL DOOR STOPPER PIN

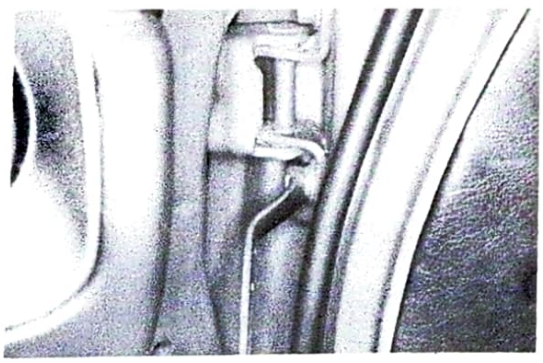


ADJUSTMENT OF DOOR

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Using a wrench*, loosen the body side hinge bolts.

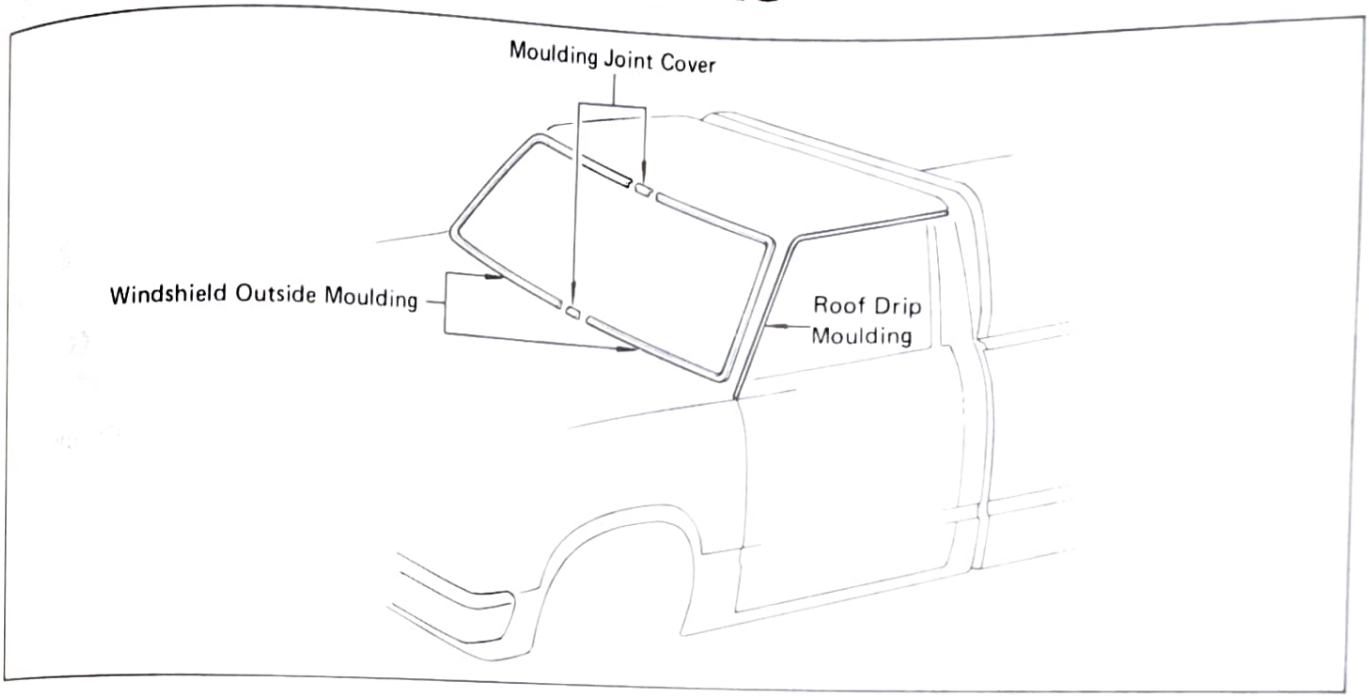
*SST 09812-30011 or Commercial wrench

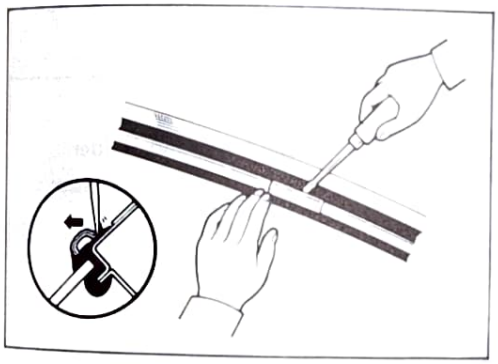


2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Using a wrench, loosen the door side hinge bolts.

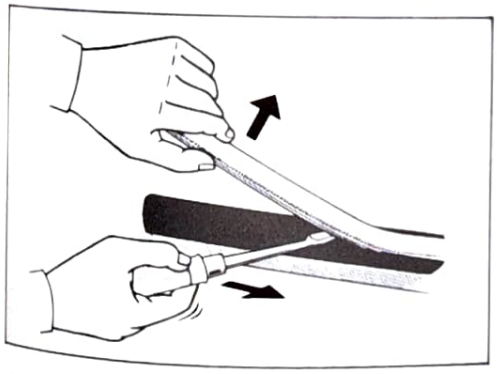
MOULDING





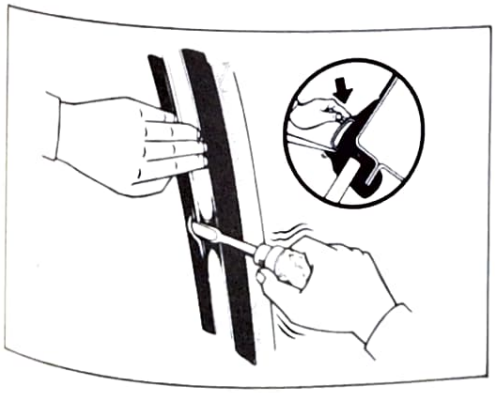
REMOVAL OF WINDSHIELD OUTSIDE MOULDING

1. REMOVE MOULDING JOINT COVER



2. REMOVE MOULDING

Use flat screwdriver to remove moulding.

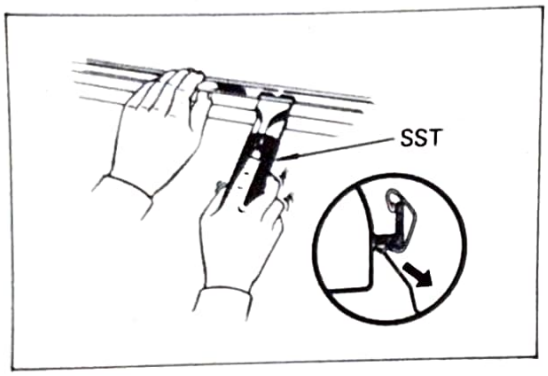


INSTALLATION OF WINDSHIELD OUTSIDE MOULDING

INSTALL MOULDING AND JOINT COVER

(a) Apply soapy water to the weatherstrip and moulding.

(b) Put one side of the moulding lip into the weatherstrip and fold over the other side with flat screwdriver.

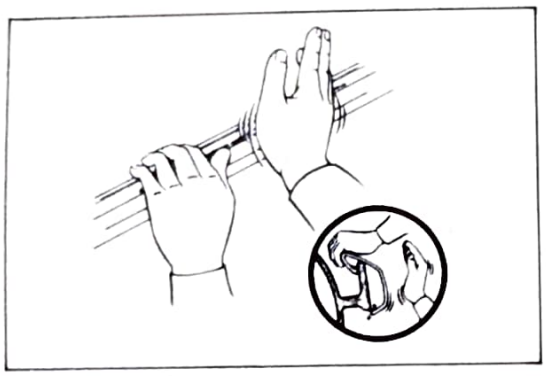


REMOVAL OF ROOF DRIP MOULDING

PULL OFF ROOF DRIP MOULDING

Use a moulding remover* to remove moulding.

*SST 09806-30010 or Commercial moulding remover

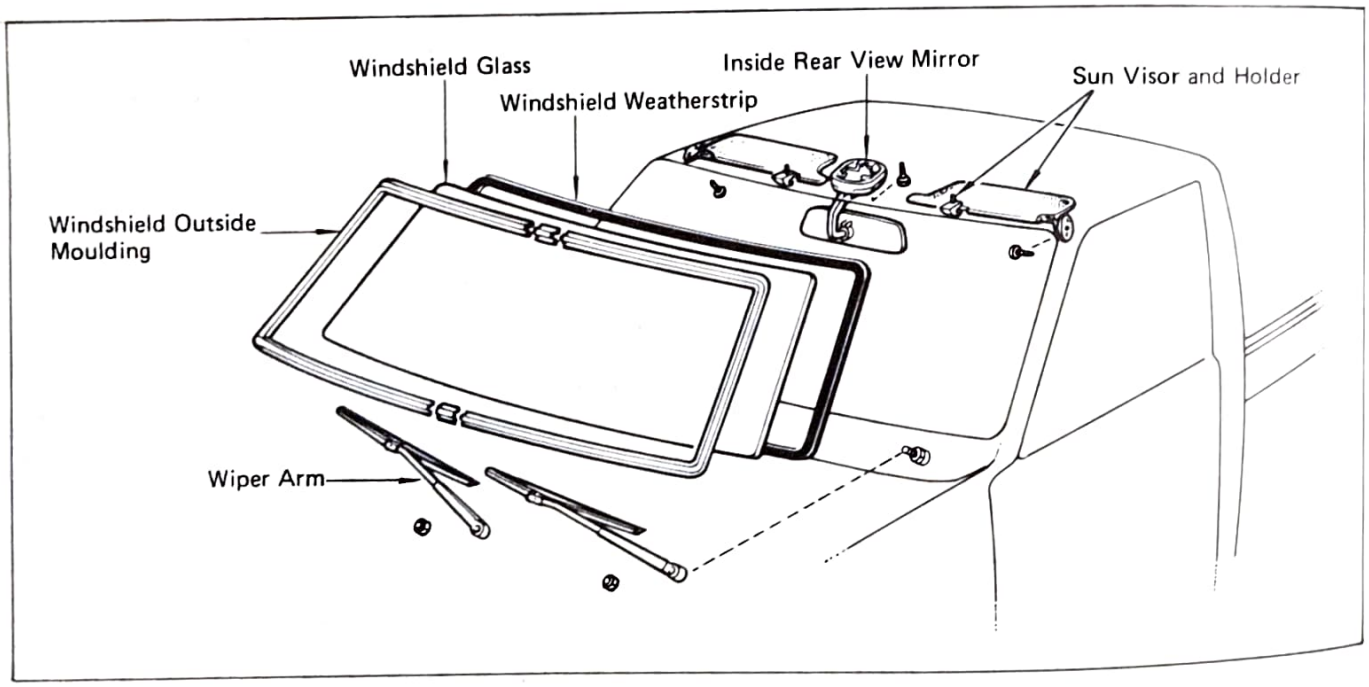


INSTALLATION OF ROOF DRIP MOULDING

INSTALL DRIP MOULDING BY HAND

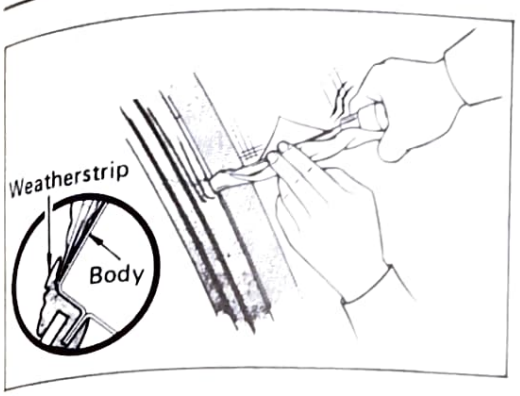
Attach upper edge of moulding to body flange. Fit moulding by tapping with hand.

WINDSHIELD



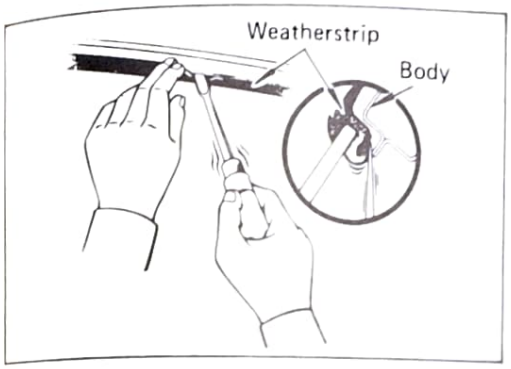
REMOVAL OF WINDSHIELD

1. REMOVE FOLLOWING PARTS:
   (a) Sun visor and holder
   (b) Inside rear view mirror
   (c) Wiper arm
   (d) Windshield outside moulding (See page 18-13)



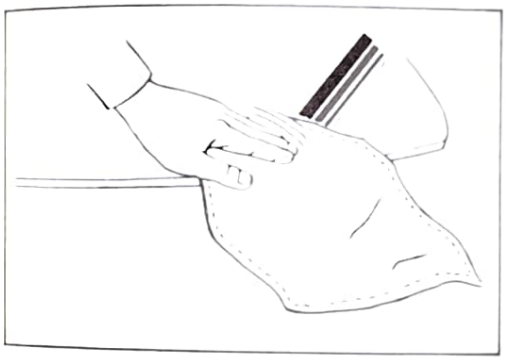
2. LOOSEN WEATHERSTRIP FROM BODY

Use screwdriver to loosen.



3. REMOVE WINDSHIELD GLASS

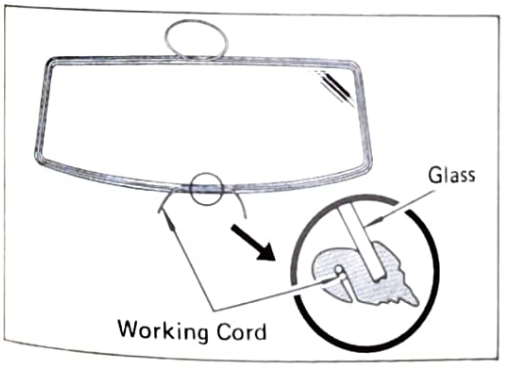
Force the weatherstrip lip from the interior to the body flange outside. Pull the glass outward and remove with the weatherstrip.



INSTALLATION OF WINDSHIELD

1. CLEAN BODY AND GLASS

Wipe off any adhesive left on body or glass with alcohol.

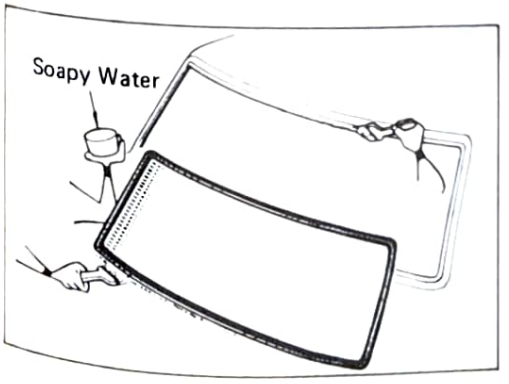


2. INSTALL WEATHERSTRIP ON GLASS

(a) Attach the weatherstrip to the glass.

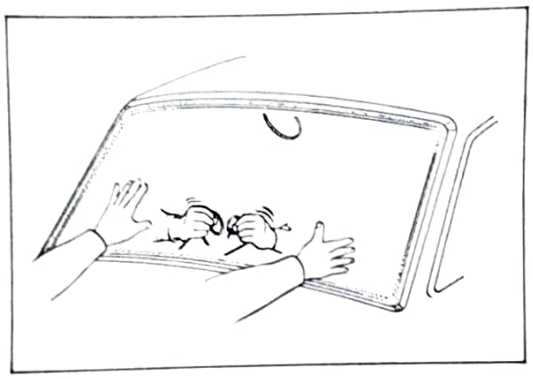
CAUTION: If the weatherstrip has become hard, it may develop water leaks. Use a new one if possible.

(b) Apply a working cord along the weatherstrip groove as shown.



3. INSTALL GLASS

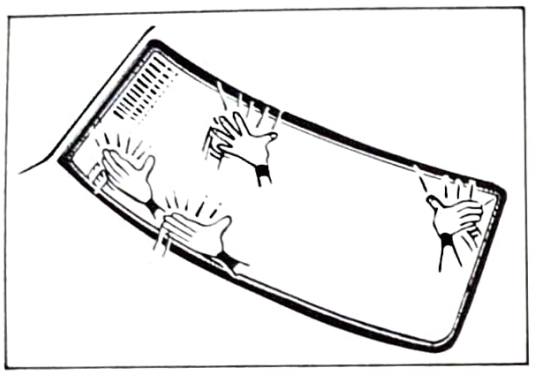
(a) Apply soapy water to the contact face of the weatherstrip lip and to the body flange.



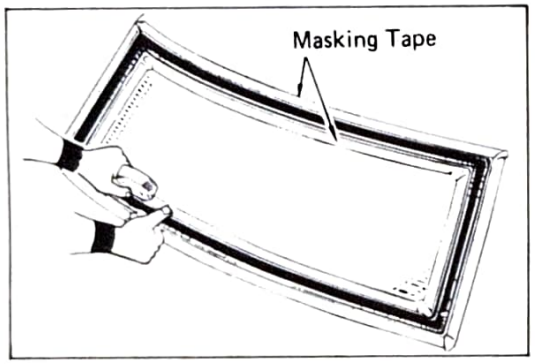
NOTE: Begin installation in the middle of the lower part of the glass.

(b) Hold the glass in position on the body.

(c) Install the glass by pulling cord from the interior, while pushing the outside of the weatherstrip with your open hand.

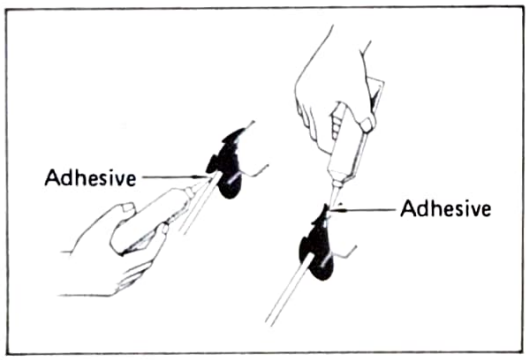


(d) To settle the glass in place, tap from outside with your open hand.



4. APPLY ADHESIVE

(a) Put masking tape around the weatherstrip to protect the paint and glass.



(b) Apply adhesive between weatherstrip and glass and between weatherstrip and body.

NOTE: When adhesive is dry, remove masking tape.

5. INSTALL FOLLOWING PARTS:

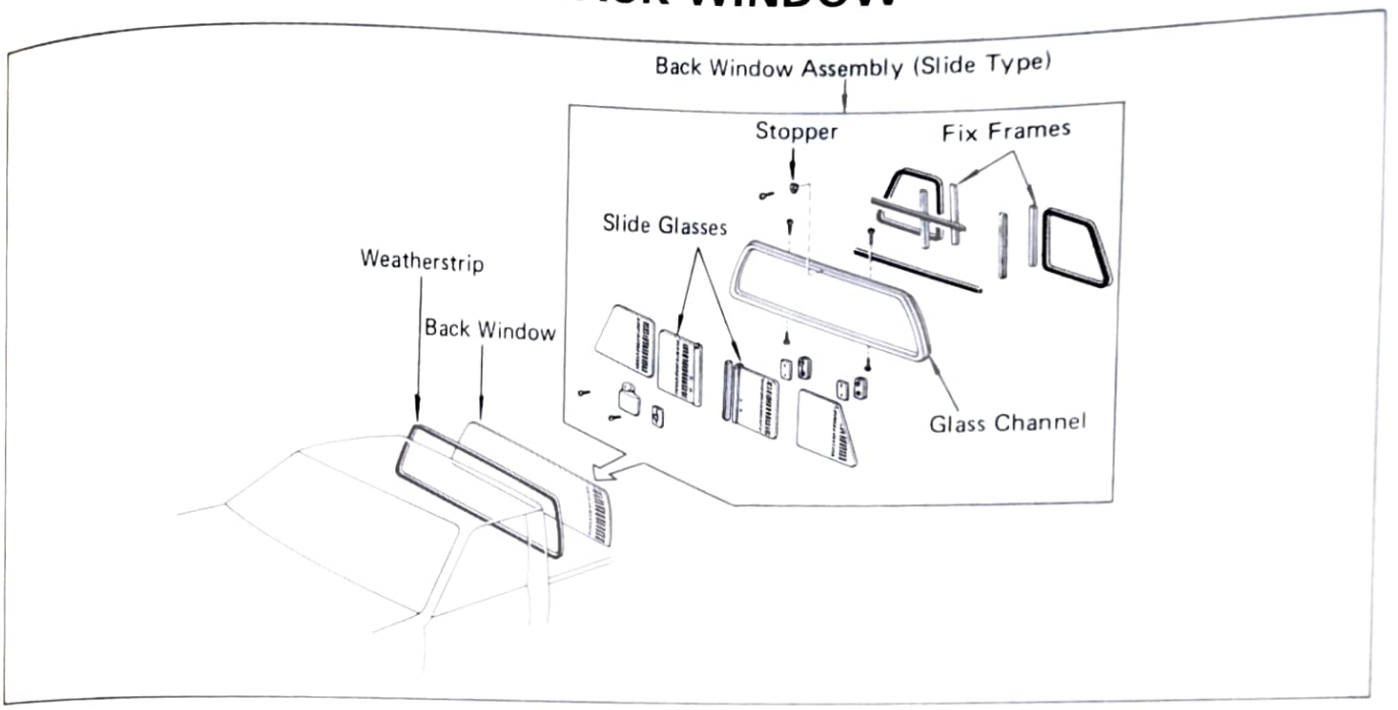
(a) Windshield outside moulding (See page 18-13)

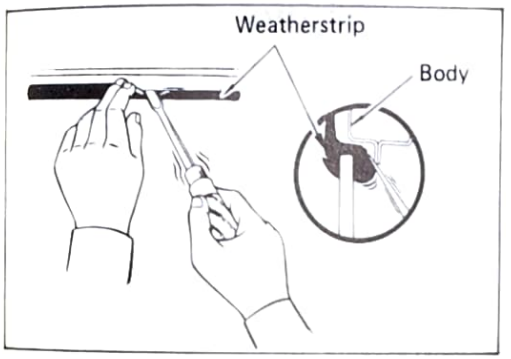
(b) Wiper arm

(c) Inside rear view mirror

(d) Sun visor and holder

BACK WINDOW

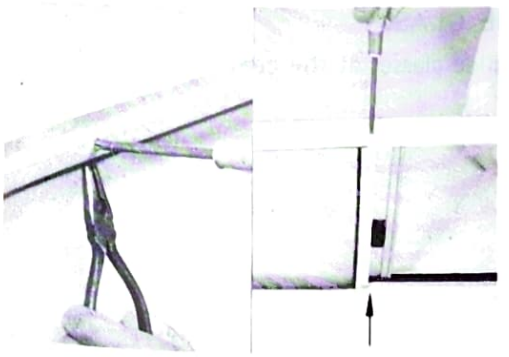




REMOVAL OF BACK WINDOW

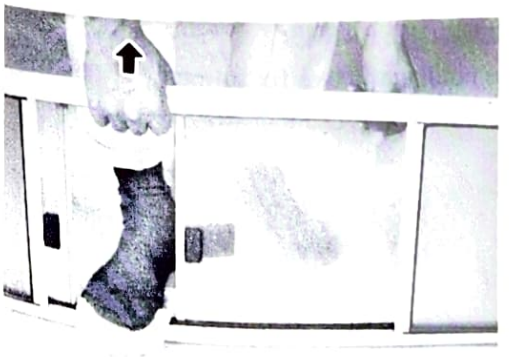
REMOVE BACK WINDOW

Force the weatherstrip lip from the interior to the body flange outside. Pull the back window outward and remove with the weatherstrip.



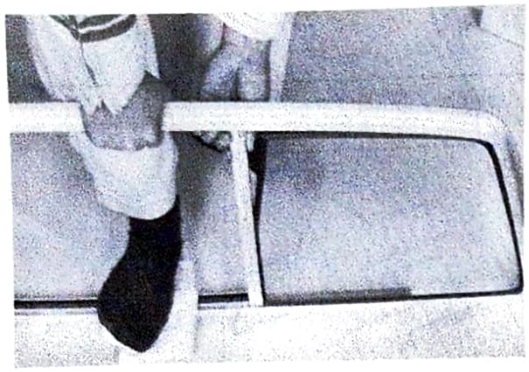
DISASSEMBLY OF BACK WINDOW ASSEMBLY (SLIDE GLASS TYPE)

1. REMOVE FOLLOWING PARTS:
   (a) Back window slide glass stopper
   (b) Four screws holding the two fix frames



2. REMOVE SLIDE GLASS

Pull apart the channels and remove the two slide glasses at the center area of the glass channel.



3. REMOVE NON-SLIDE GLASS

(a) Pull apart the channels and remove the two fix frames as shown.

(b) Pull apart the channels and remove the two non-slide glasses as shown.

ASSEMBLY OF BACK WINDOW ASSEMBLY

1. INSTALL NON-SLIDE GLASS

(a) Apply soapy water to the contact face of the weather-strip and to the glass channel flange.

(b) Install the two non-slide glasses.

(c) Install the two fix frames.

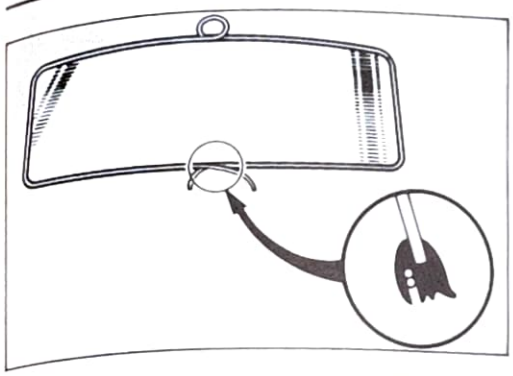
2. INSTALL SLIDE GLASS

Install the two slide glasses at the center area of the glass channel.

3. INSTALL FOLLOWING PARTS:

(a) Four screws holding the two fix frames

(b) Back window slide glass channel stopper



INSTALLATION OF BACK WINDOW

1. INSTALL WEATHERSTRIP ON BACK WINDOW

(a) Attach the weatherstrip to the back window.

CAUTION: If the weatherstrip has become hard, it may develop water leaks. Use a new one if possible.

(b) Apply a working cord along the weatherstrip groove as shown.

2. INSTALL BACK WINDOW

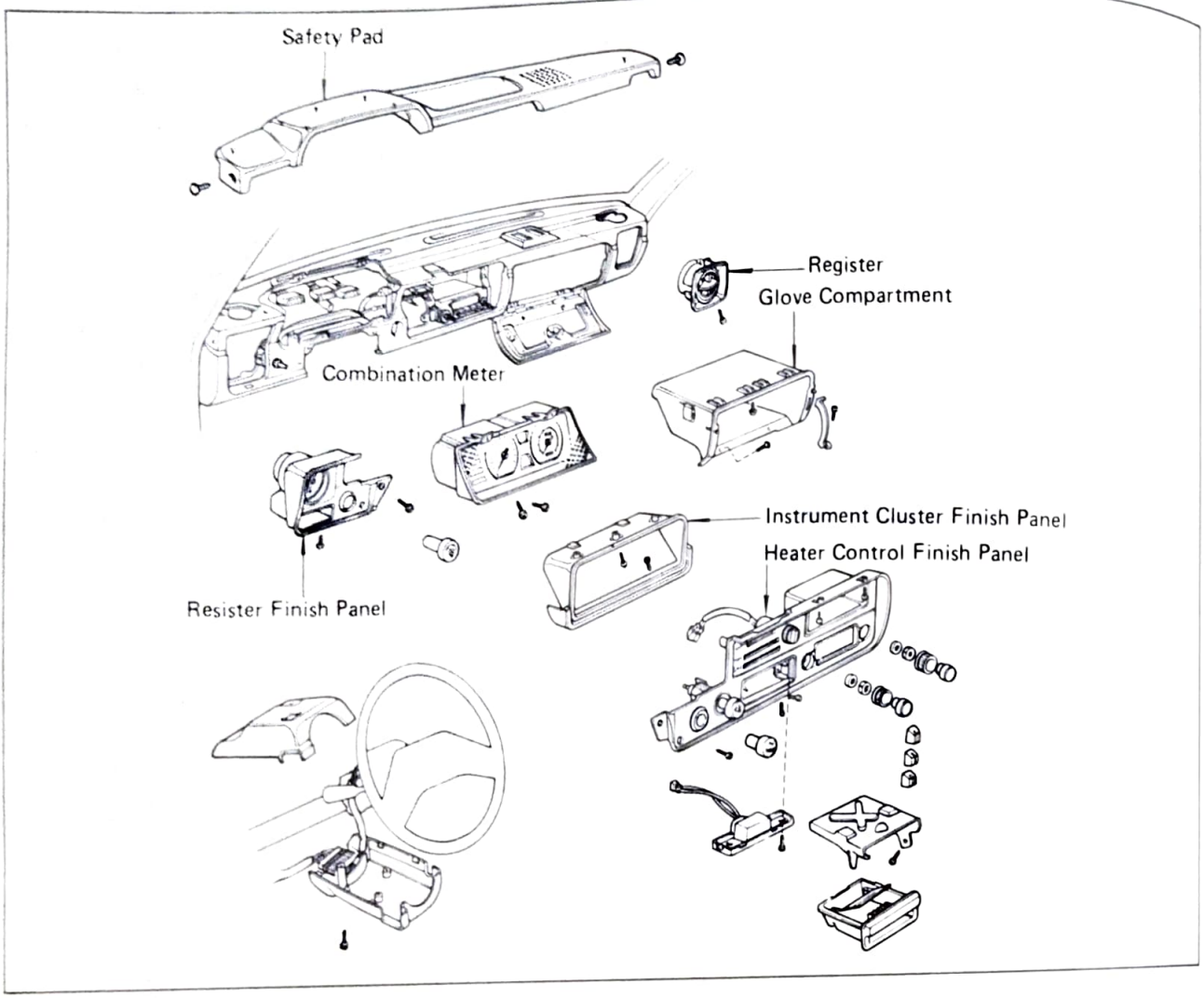
NOTE: Begin installation in the middle of the lower part of the glass.

(a) Hold the back window in position on the body.

(b) Install the back window by pulling cord from the interior, while pushing the outside of the weatherstrip with your open hand.

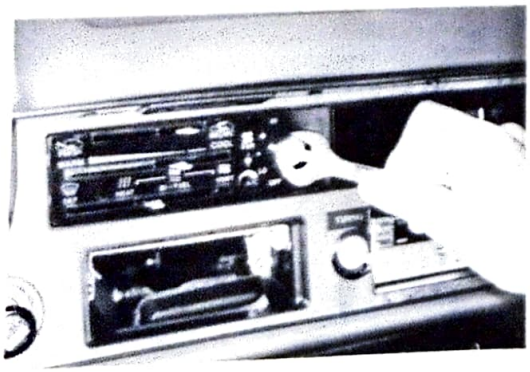
(c) To settle the back window in place, tap from outside with your open hand.

SAFETY PAD

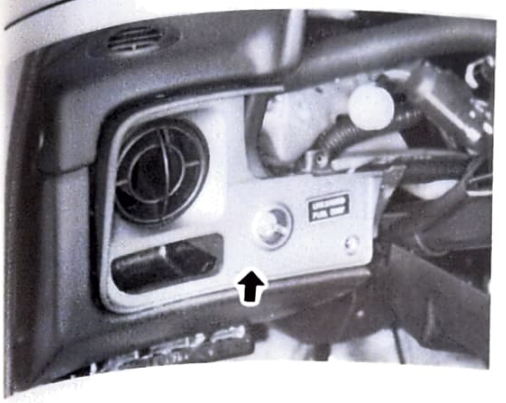


REMOVAL OF SAFETY PAD

1. DISCONNECT NEGATIVE CABLE FROM BATTERY TERMINAL
2. REMOVE COMBINATION METER (See page 17-25)



3. REMOVE HEATER CONTROL FINISH PANEL
   (a) Remove the knobs from the radio and the heater control.
   (b) Remove screws holding the panel.
   (c) Disconnect four wiring connectors and remove the panel.



4. REMOVE FOLLOWING PARTS:
   (a) Register finish panel
   (b) Glove compartment
   (c) Register
   (d) Safety pad

INSTALLATION OF SAFETY PAD

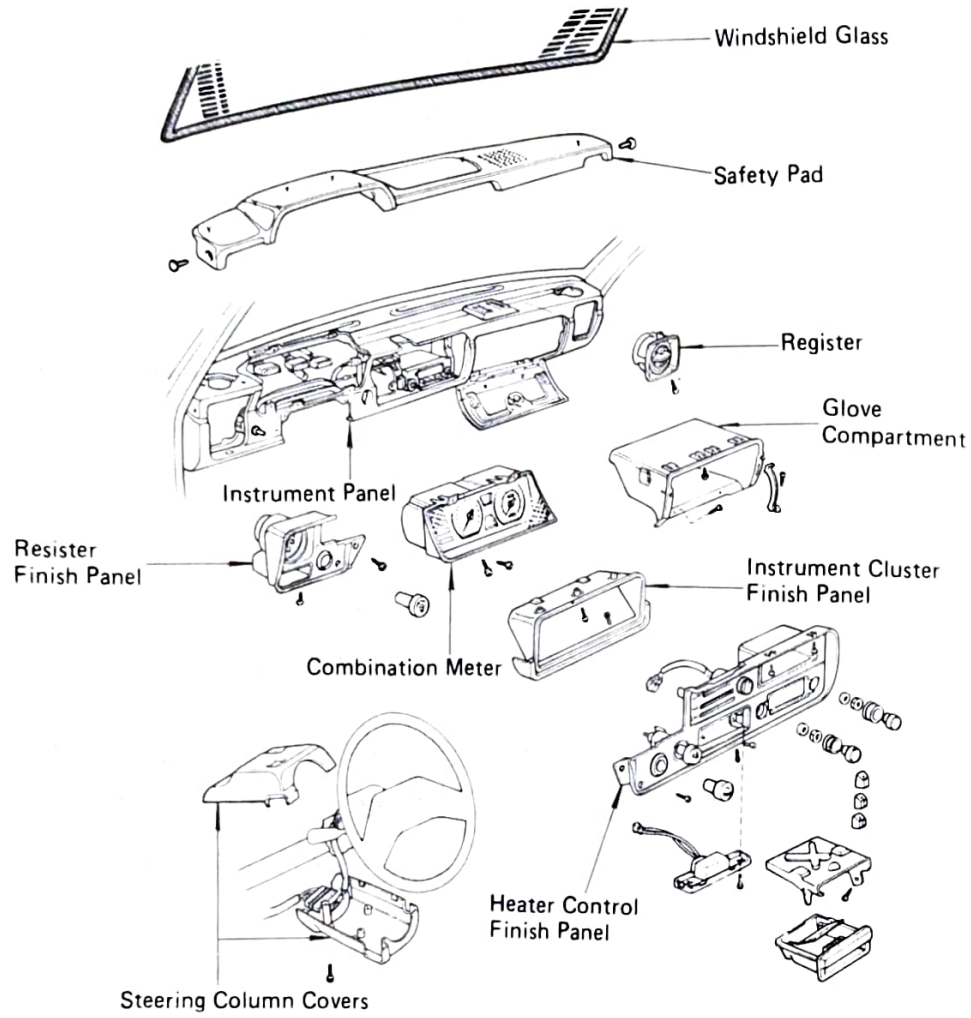
1. INSTALL FOLLOWING PARTS:
   (a) Safety pad
   (b) Register
   (c) Glove compartment
   (d) Register finish panel

2. INSTALL HEATER CONTROL FINISH PANEL
   (a) Connect four wiring connectors.
   (b) Install the panel with screws.
   (c) Install the knobs on the radio and the heater control

3. INSTALL COMBINATION METER (See page 17-28)

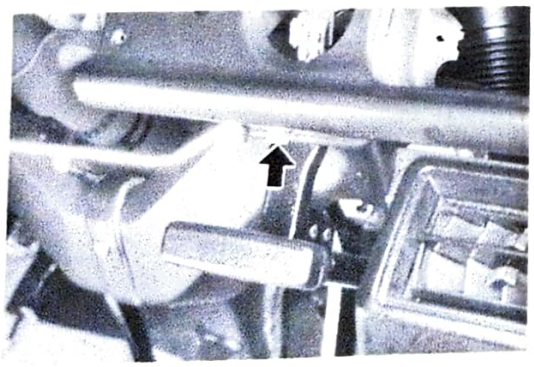
4. INSTALL NEGATIVE CABLE TO BATTERY TERMINAL

INSTRUMENT PANEL



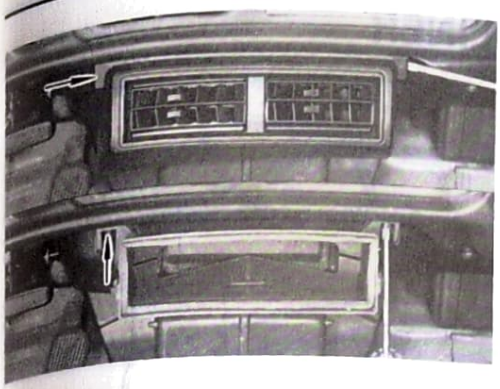
REMOVAL OF INSTRUMENT PANEL

1. **REMOVE FOLLOWING PARTS:**
   - (a) Windshield glass (See page 18-14)
   - (b) Safety pad (See page 18-20)
   - (c) Heater control (See page 17-33)
   - (d) Fuse box

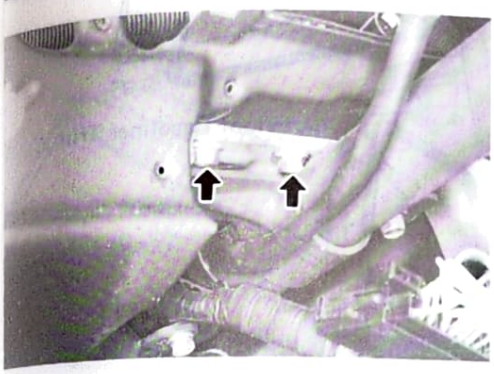


2. **REMOVE PARKING BRAKE LEVER MOUNTING BOLTS AS SHOWN**

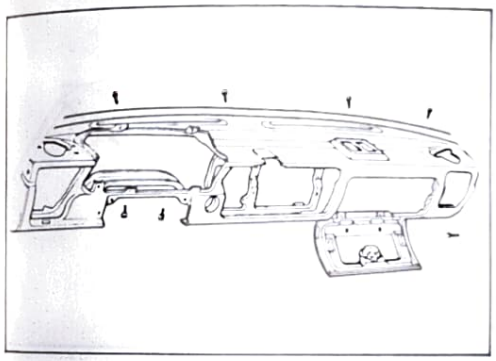
   Remove two bolts.



3. REMOVE HEATER UNIT MOUNTING SCREWS AS SHOWN
   (a) Remove two screws from the heater grille.
   (b) Remove two screws from the heater unit.



4. REMOVE BRAKE PEDAL SUPPORT MOUNTING BOLTS AS SHOWN
   (a) Remove two bolts from the steering column tube bracket.
   (b) Remove two bolts from the pedal support.

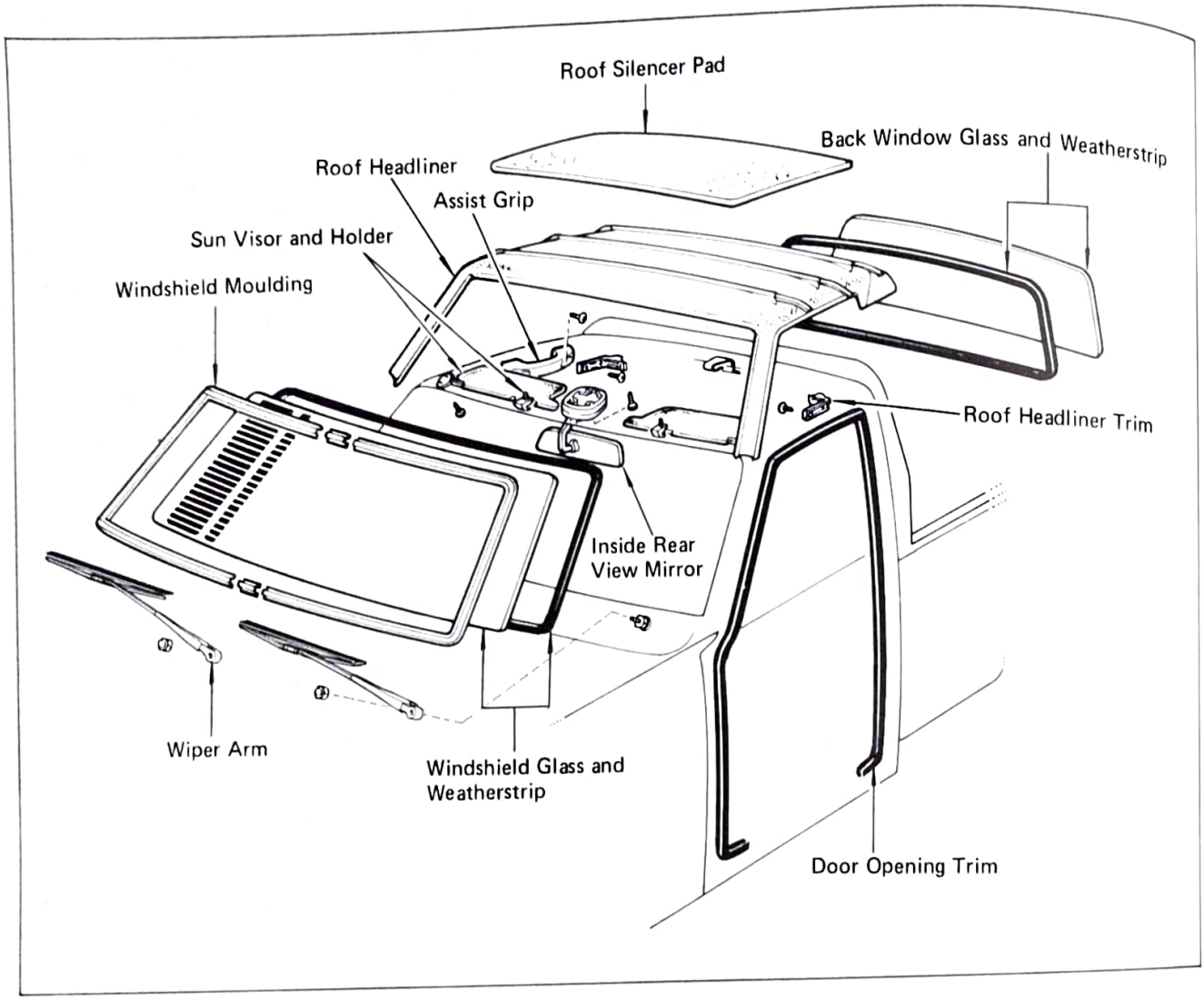


5. REMOVE INSTRUMENT PANEL
   (a) Remove screws holding the instrument panel.
   (b) Pull out the instrument panel.

INSTALLATION OF INSTRUMENT PANEL

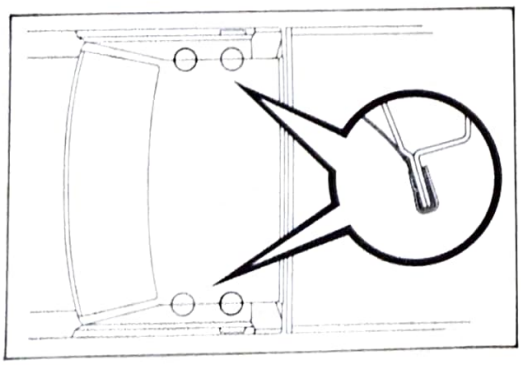
INSTALL PARTS OF INSTRUMENT PANEL IN REVERSE ORDER OF REMOVAL

ROOF HEADLINER

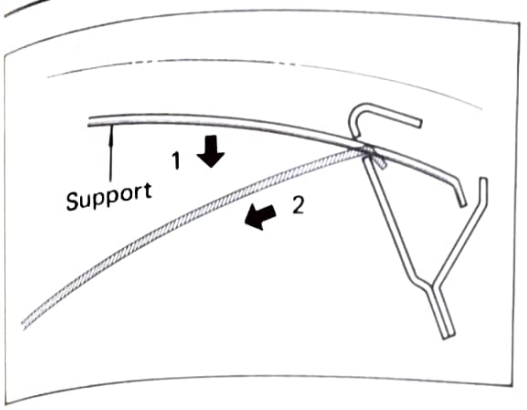


REMOVAL OF ROOF HEADLINER

1. REMOVE FOLLOWING PARTS:
   (a) Door opening trim
   (b) Windshield glass (See page 18-14)
   (c) Back window glass (See page 18-17)
   (d) Assist grip
   (e) Roof headliner trim



2. REMOVE HEADLINER
   (a) Remove the clips as shown.
   (b) Tear off glued parts of the headliner.

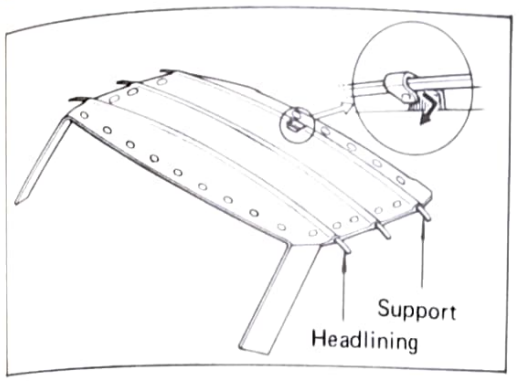


NOTE: Begin with the front support and remove the supports in turn.

(c) Tilt each support downward. Unhook the support hook on the rear.

(d) Pull out the support downward from hole in the body retainer.

(e) Remove support from the headliner.



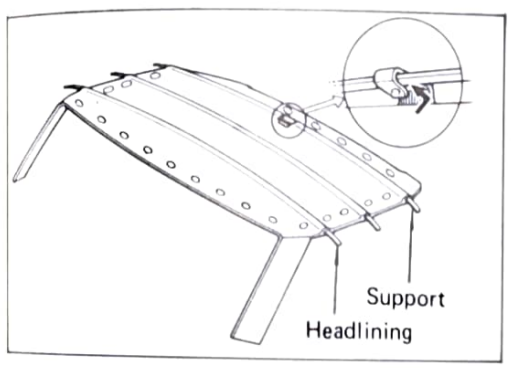
INSTALLATION OF ROOF HEADLINER

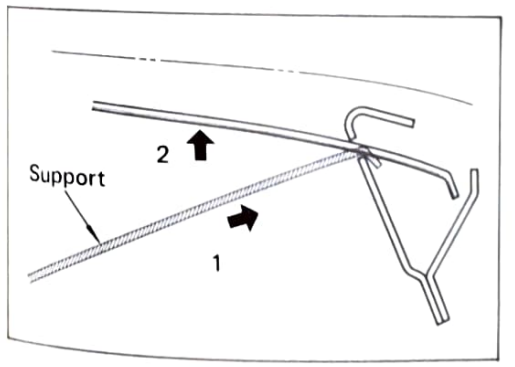
1. WIPE OLD ADHESIVE AND DIRT OFF BODY

2. INSTALL HEADLINER SUPPORTS

(a) Insert the headliner supports through the headliner.

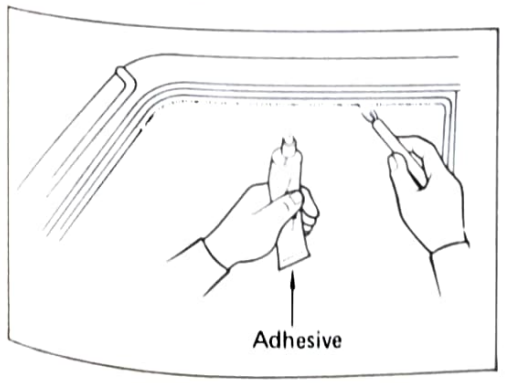
(b) Install the support hook as shown.





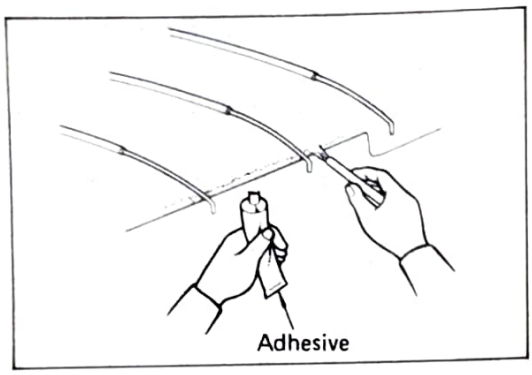
(c) Insert both support ends in holes in the body.

(d) Pull supports up toward the roof to tighten the headliner.

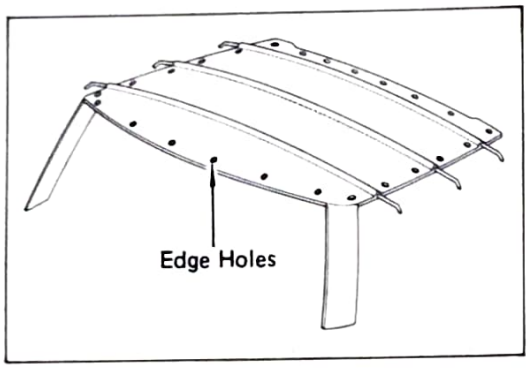


3. APPLY ADHESIVE

Roof headliner	Part No.	Part name
Vinyl leather	08704-00010	Weatherstrip adhesive super



Apply a coat of adhesive to the edge of the headliner and the body surface where the headliner attaches.

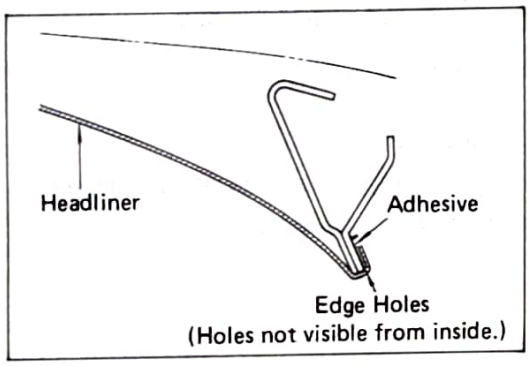


4. **INSTALL HEADLINER**

NOTE: Allow the adhesive to dry 3 to 5 minutes before installing.

(a) Position the headliner edge holes at the body surface where the headliner attaches.

(b) Pull on the headliner until the edge holes cannot be seen from the inside and attach it so as to avoid wrinkling.



(c) Install the clips.

5. **INSTALL FOLLOWING PARTS:**

(a) Roof headliner trim

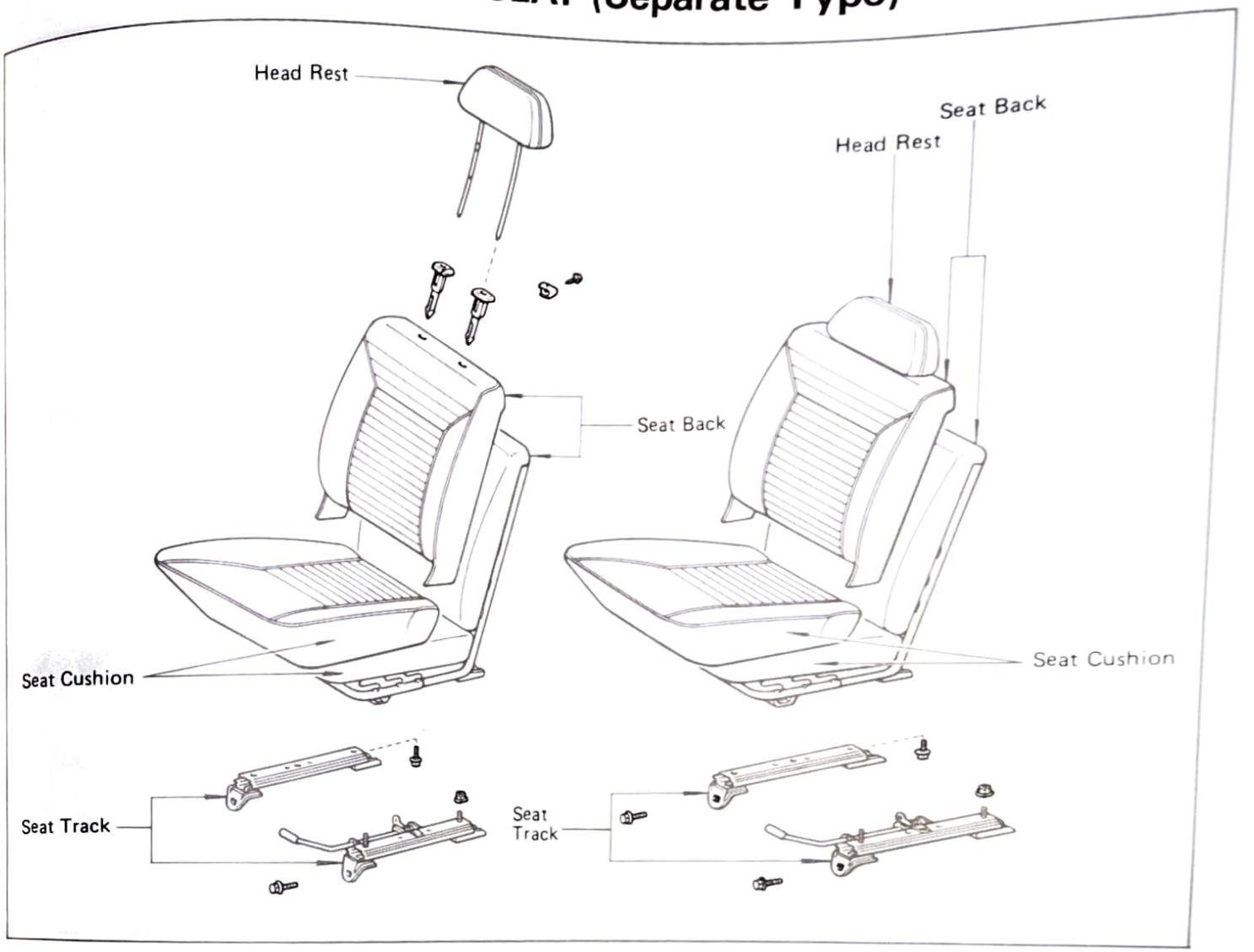
(b) Assist grip

(c) Back window glass (See page 18-19)

(d) Windshield glass (See page 18-15)

(e) Door opening trim

SEAT (Separate Type)



REMOVAL OF SEAT

1. REMOVE SEAT

   Remove four mounting bolts holding seat track and remove seat.

2. DISASSEMBLE AND REPAIR SEAT AS NECESSARY

INSTALLATION OF SEAT

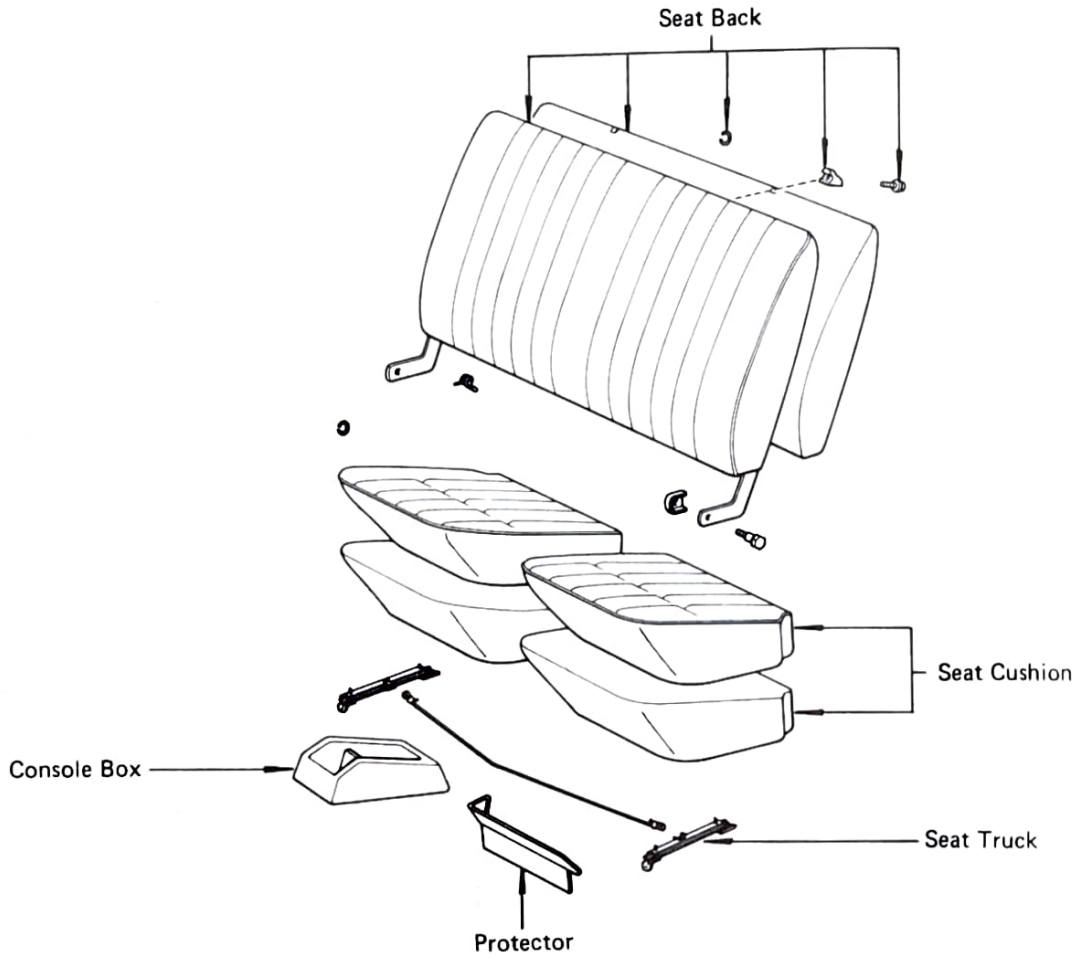
1. ASSEMBLE SEAT AS NECESSARY

2. INSTALL SEAT

   Install four mounting bolts in the seat track. Torque bolts.

   Torque: 2.0 – 3.0 kg-m (15 – 22 ft-lb)

SEAT (Bench Type)



REMOVAL OF SEAT

1. REMOVE SEAT

   Remove four mounting bolts holding seat track and remove seat.

2. DISASSEMBLE AND REPAIR SEAT AS NECESSARY

INSTALLATION OF SEAT

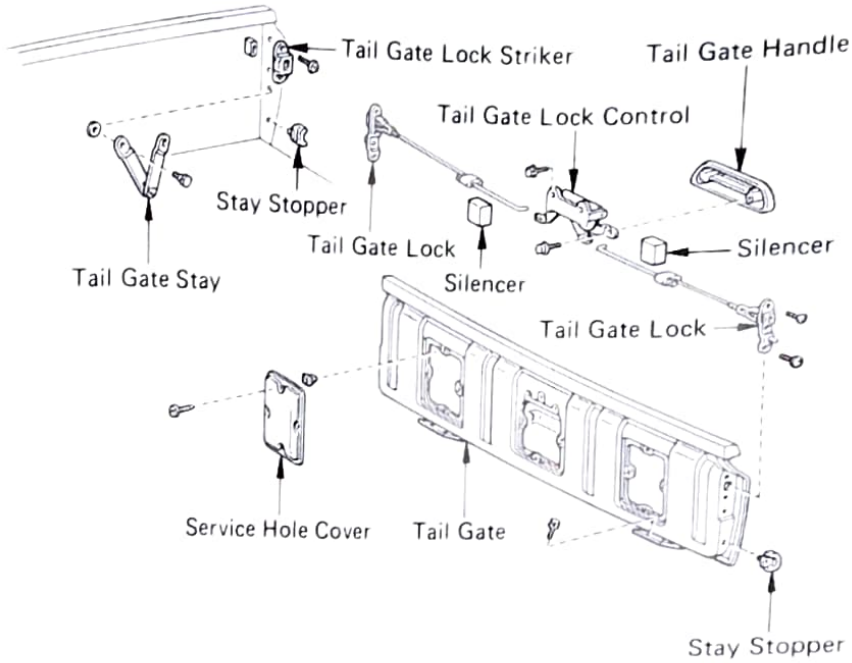
1. ASSEMBLE SEAT AS NECESSARY

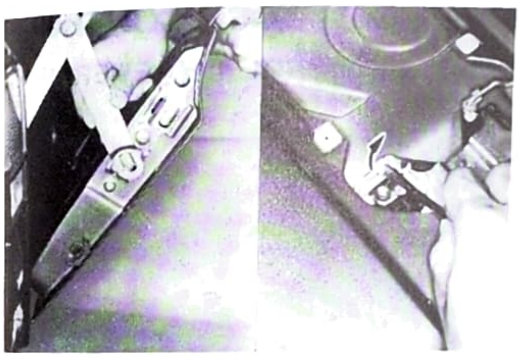
2. INSTALL SEAT

   Install four mounting bolts in the seat track. Torque bolts.

   Torque: 2.0 – 3.0 kg-m (15 – 22 ft-lb)

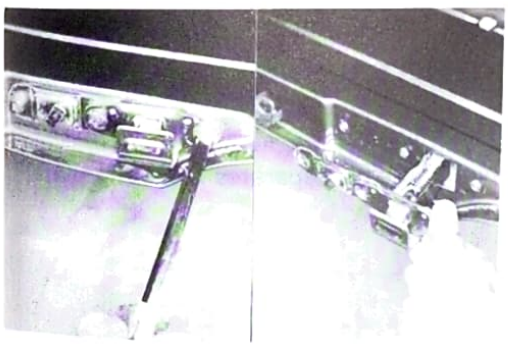
ONE-TOUCH TAIL GATE



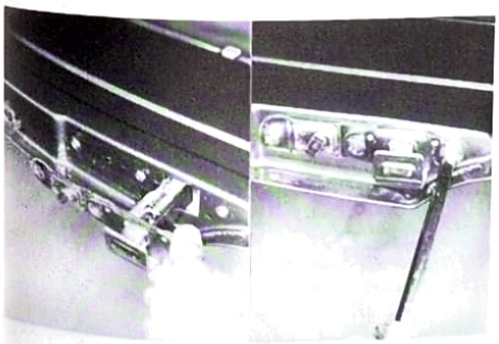


REMOVAL OF TAIL GATE LOCK

1. DISCONNECT TAIL GATE STAY FROM TAIL GATE LOCK
2. REMOVE SERVICE HOLE COVER
3. DISCONNECT TAIL GATE LOCK LINK FROM TAIL GATE LOCK CONTROL

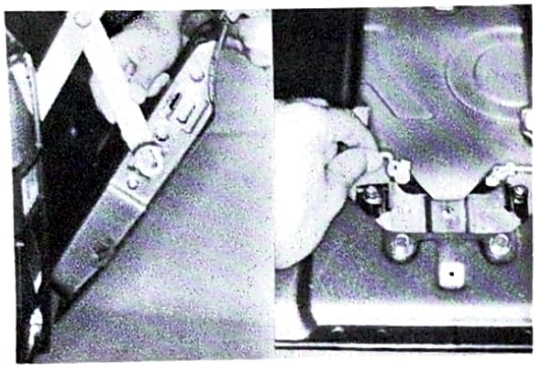


4. REMOVE THREE SET SCREW FROM TAIL GATE LOCK
5. PULL OUT TAIL GATE LOCK FROM TAIL GATE

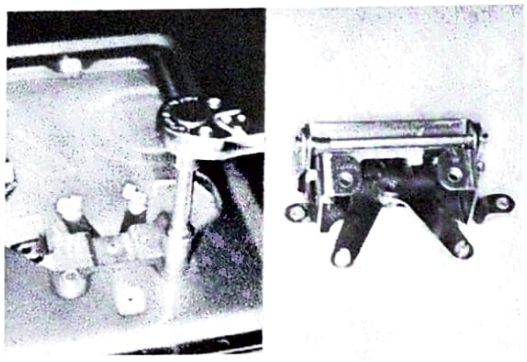


INSTALLATION OF TAIL GATE LOCK

1. PUT IN TAIL GATE LOCK TO TAIL GATE
2. INSTALL THREE SET SCREWS



3. CONNECT TAIL GATE STAY TO TAIL GATE LOCK
4. CONNECT TAIL GATE LOCK LINK TO TAIL GATE LOCK CONTROL
5. INSTALL SERVICE HOLE COVER

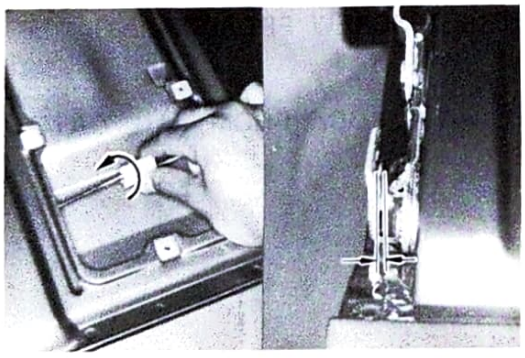


REMOVAL OF TAIL GATE LOCK CONTROL

1. REMOVE SERVICE HOLE COVER
2. DISCONNECT TWO TAIL GATE LOCK LINKS
3. REMOVE TAIL GATE LOCK HANDLE
4. REMOVE TAIL GATE LOCK CONTROL

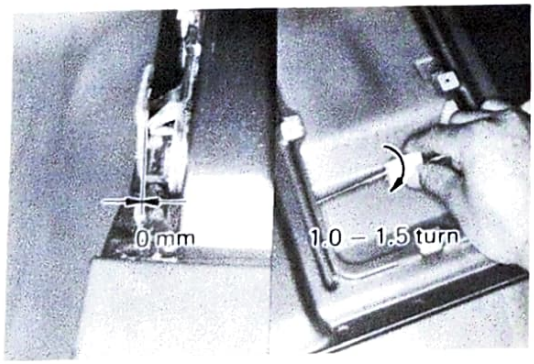
INSTALLATION OF TAIL GATE LOCK CONTROL

INSTALL TAIL GATE LOCK CONTROL IN REVERSE ORDER OF REMOVAL



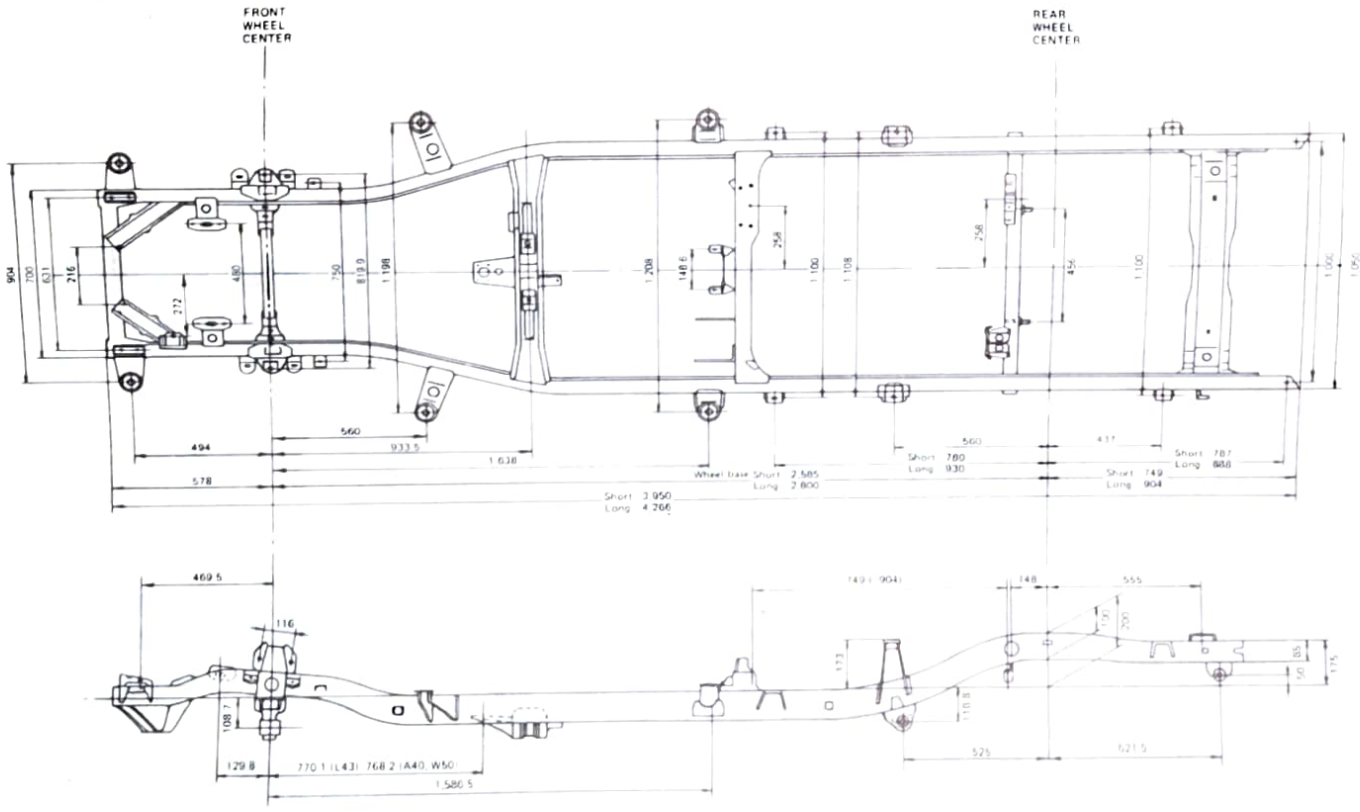
ADJUSTMENT OF TAIL GATE LOCK

1. REMOVE SERVICE HOLE COVER
2. ADJUST TAIL GATE LOCK
   (a) Turn the snap until the bar separates from the plate.



   (b) Turn the snap until the bar makes contact with the plate and then turn it one half to one turn further.
3. INSTALL SERVICE HOLE COVER

BODY DIMENSIONS (RN 4×2)

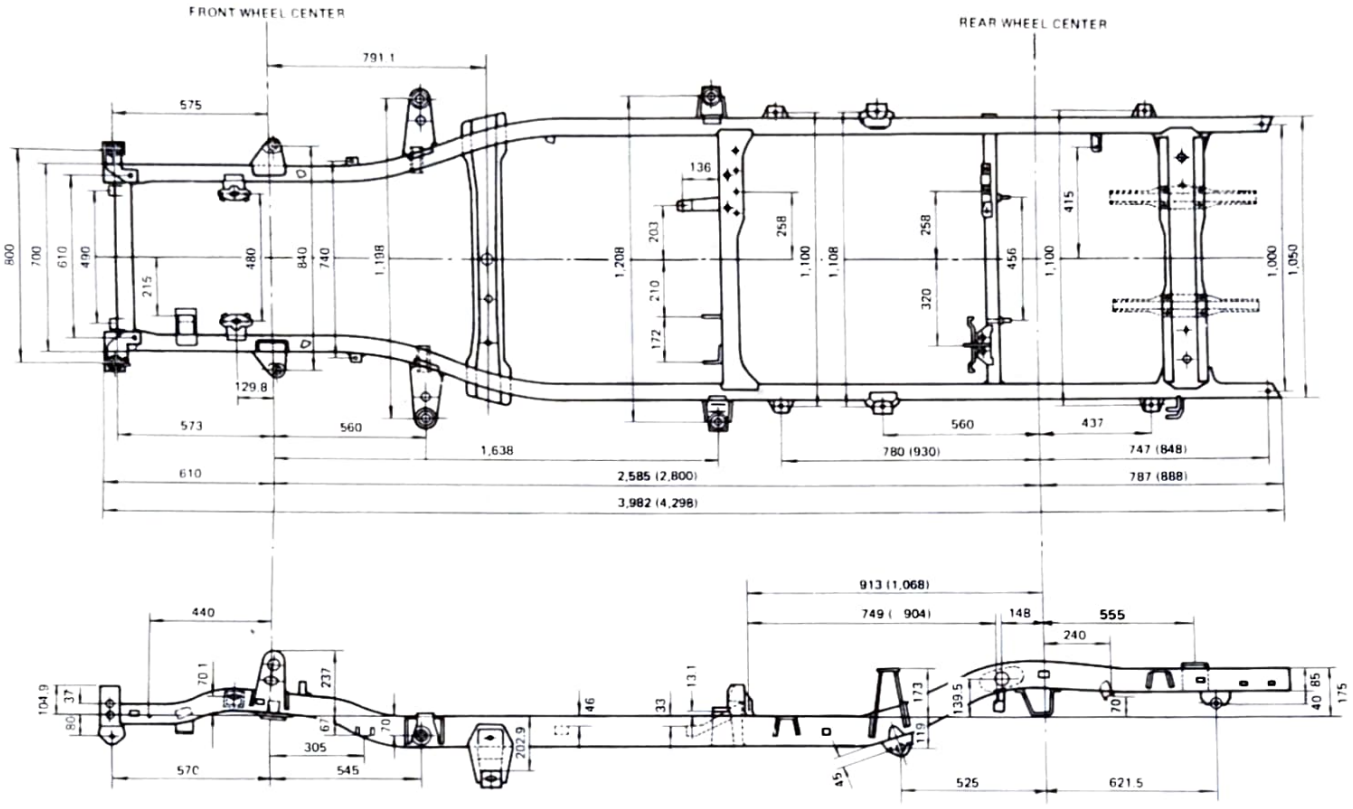


RN 34 series	SHORT WHEEL BASE
RN 44 series	LONG WHEEL BASE

NOTE: The figures in parenthesis are for Long Wheel Base Vehicles.

Conversion table			
mm	in.	mm	in.
50	1.97	780	30.71
85	3.35	787	30.98
100	3.94	819.9	32.28
108.7	4.28	848	33.39
116	4.57	888	34.96
118.8	4.68	904	35.59
129.8	5.11	930	36.61
148.6	5.85	933.5	36.75
148	5.83	1,000	39.37
173	6.81	1,050	41.34
175	6.89	1,100	43.31
118.8	4.68	1,108	43.62
200	7.87	1,198	47.17
216	8.50	1,208	47.56
258	10.16	1,586.5	62.46
272	10.71	1,638	64.49
437	17.20	2,585	101.77
456	17.95	3,950	155.51
469.5	18.48		
480	18.90		
494	19.45		
525	20.67		
555	21.85		
560	22.05		
578	22.76		
621.5	24.47		
631	24.84		
700	27.56		
747	29.41		
749	29.49		
750	29.53		
768.2	30.24		
770.1	30.32		

BODY DIMENSIONS (RN 4 × 4)



RN 38 series	SHORT WHEEL BASE
RN 48 series	LONG WHEEL BASE

NOTE: The figures in parenthesis are for Long Wheel Base Vehicles.

Conversion table			
mm	in.	mm	in.
13.1	0.52	545	21.46
33	1.30	555	21.85
37	1.46	560	22.05
40	1.58	570	22.44
45	1.77	573	22.56
46	1.81	575	22.64
67	2.64	610	24.02
70	2.76	621.5	24.47
70.1	2.76	700	27.56
80	3.15	740	21.13
85	3.35	747	29.41
104.9	4.13	749	29.49
119	4.69	780	30.71
129.8	5.11	787	30.98
136	5.35	791.1	31.15
139.5	5.49	800	31.50
148	5.83	840	33.07
172	6.77	848	33.39
173	6.81	888	34.96
175	6.89	904	35.59
202.9	7.99	913	35.94
203	7.99	930	36.61
210	8.27	1,000	39.37
215	8.47	1,050	41.34
237	9.33	1,068	42.05
240	9.45	1,100	43.41
258	10.16	1,108	43.62
305	12.01	1,198	47.17
320	12.60	1,208	47.56
415	16.34	1,638	64.49
437	17.20	2,585	101.77
440	17.32	2,595	102.17
456	17.95	2,800	110.24
480	18.90	2,810	110.63
490	19.29	3,982	156.77
525	20.67	4,298	169.21

AIR CONDITIONING SYSTEM

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PRECAUTIONS

1. When handling refrigerant (R-12), the following precautions should be observed:
   (a) Always wear eye protection while handling refrigerant.
   (b) Keep the refrigerant container (service drum) below 40°C (104°F).
   (c) Do not handle refrigerant in an enclosed area having an open flame.
   (d) Discharge refrigerant slowly when purging the system.
   (e) Be careful the liquid refrigerant does not contact the skin.
2. If liquid refrigerant gets in the eyes or on the skin:
   (a) Do not rub the eye or skin.
   (b) Wash the area with a lot of cool water.
   (c) Apply clean petroleum jelly to the skin.
   (d) Rush to a physician or hospital for immediate professional treatment.
   (e) Do not attempt to treat yourself.

When tubing:

(a) Apply a few drops of refrigeration oil to the seats of O-ring fitting.
(b) Tighten the O-ring fittings at the specified torque.
(c) Tighten the nut using two wrenches to avoid twisting tube.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
No cooling or warm air	Magnetic clutch does not engage		
	(a) HEATER and A/C fuse (10A) blown	Replace fuse and check for short	
	(b) Magnetic clutch faulty	Check magnetic clutch	19-13
	(c) A/C switch faulty	Check switch	19-40
	(d) Thermistor faulty	Check thermistor	19-40
	(e) Idling stabilizer amplifier faulty	Check amplifier	19-43
	(f) Wiring or ground faulty	Repair as necessary	
	(g) Empty refrigerant	Check refrigerant pressure (Pressure should be 2.11 kg/cm^2 or 30 psi minimum)	19-44
		Check pressure switch	19-44
	(h) Thermo switch (only for 4-wheel drive model)	Check thermo switch	19-44
	Compressor does not rotate properly		
	(a) Drive belt loose or broken	Adjust or replace drive belt	4-43
	(b) Compressor faulty	Check compressor	19-13
	Blower does not operate	Troubleshoot heater	17-31
	Expansion valve faulty	Check expansion valve	19-36
	Leak in system	Check system for leak	19-7
	Fusible plug on receiver blown or clogged screen	Check receiver	19-35
Cool air comes out intermittently	Magnetic clutch slipping	Check magnetic clutch	19-13
	Expansion valve faulty	Check expansion valve	19-36
	Wiring connection faulty	Repair as necessary	
	Excessive moisture in the system	Evacuate and charge system	19-6

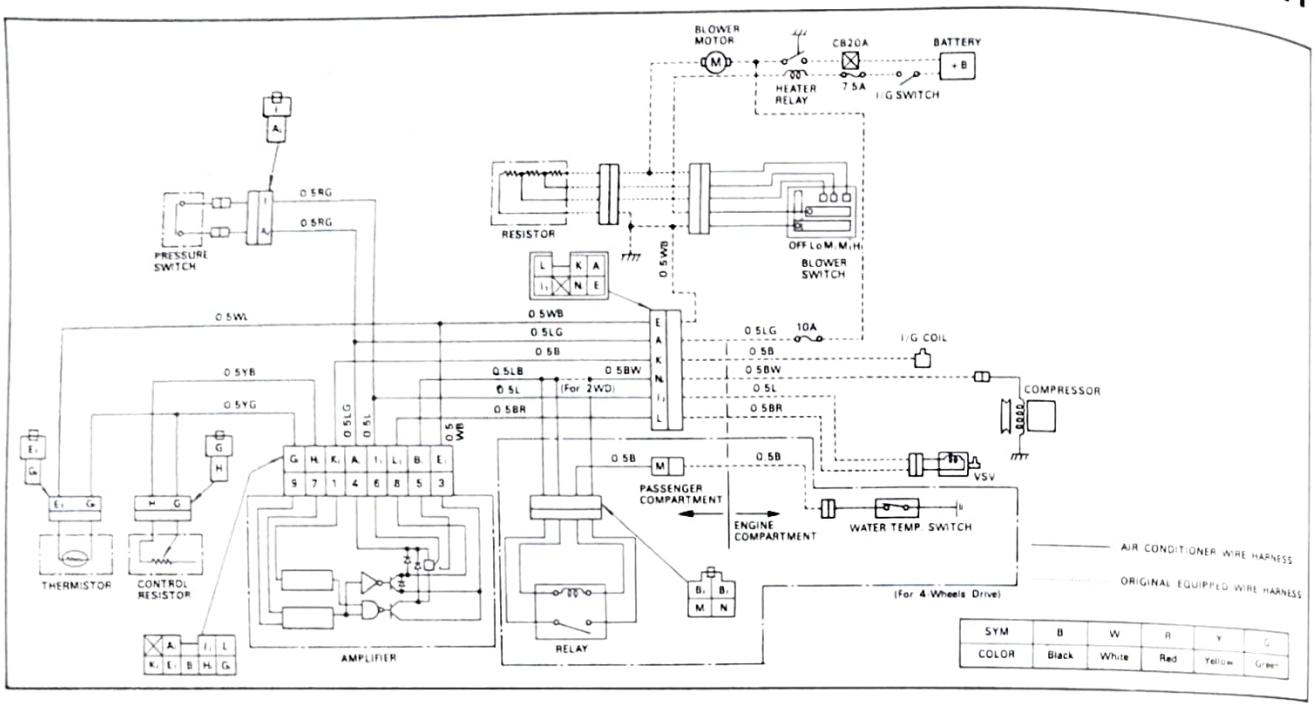
TROUBLESHOOTING (CONT'D)

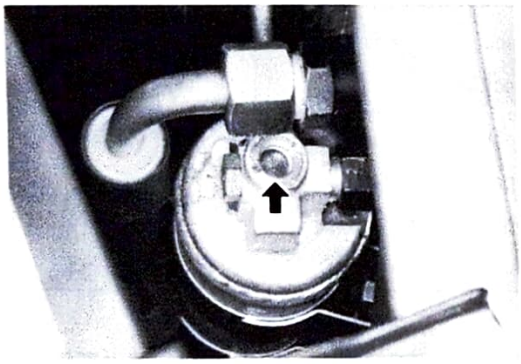
Problem	Possible cause	Remedy	Page
Limited amount of cool air at high speed	Thermistor faulty	Check thermistor	19-40
	Idling stabilizer amplifier faulty	Check amplifier	19-43
Cool air comes out only at high speed	Condenser clogged	Check condenser	19-34
	Drive belt slipping	Check or replace drive belt	4-43
	Compressor faulty	Check compressor	19-13
	Insufficient or too much refrigerant	Check refrigerant charge	19-4
	Air in system	Evacuate and charge system	19-6
Insufficient cooling	Condenser clogged	Check condenser	19-34
	Drive belt slipping	Check or replace drive belt	4-43
	Magnetic clutch faulty	Check magnetic clutch	19-13
	Compressor faulty	Check compressor	19-13
	Expansion valve faulty	Check expansion valve	19-36
	Thermistor faulty	Check thermistor	19-40
	Idling stabilizer amplifier faulty	Check amplifier	19-43
	Insufficient or too much refrigerant	Check refrigerant charge	19-4
	Air or excessive compressor oil in system	Evacuate and charge system	19-6
	Receiver clogged	Check receiver	19-35
Insufficient velocity of cooled air	Evaporator clogged or frosted	Check evaporator	19-37
	Air leakage from cooling unit or air duct	Repair as necessary	
	Air inlet blocked	Repair as necessary	
	Blower motor faulty	Replace blower motor	17-32

SPECIAL TOOLS AND TEST EQUIPMENT

Tool	SST No.	Use
Manifold gauge set	Commercial	To evacuate and charge system
Ohmmeter	Commercial	To check magnetic clutch
P-type magnetic clutch tool kit	07110-77011	To repair magnetic clutch
Pressure plate remover	07112-71010	To remove pressure plate
Key remover	07112-45020	To remove shaft key
Hexagon wrench	07110-61050 or Commercial	To remove service valves and front housing
Valve plate removing tool	07112-35010 or Commercial	To remove valve plate
Cylinder installation rings	07115-25020	To measure shoe clearance
Key installing tool	07114-45010	To install shaft key
Shoe gauge	07115-15030	To adjust shoe clearance
Rubber seal replacer	07114-34010	To install rubber seal
Seal plate replace	07114-35010 or Commercial	To install seal plate
Test nozzle	07115-71010	To check compressor

AIR CONDITIONING SYSTEM CIRCUIT



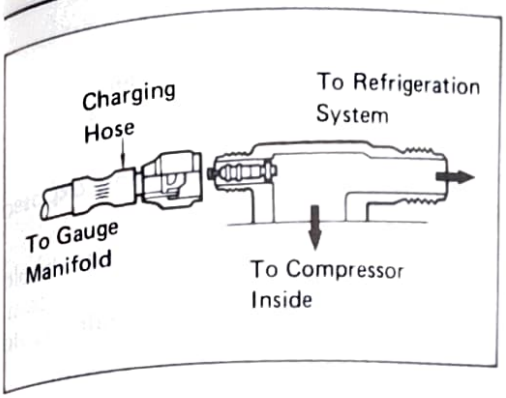


REFRIGERATION SYSTEM

Checking of Refrigerant Charge

1. RUN ENGINE AT FAST IDLE
2. OPERATE AIR CONDITIONER AT MAXIMUM COOLING FOR A FEW MINUTES
3. CHECK AMOUNT OF REFRIGERANT
   Observe the sight glass on the receiver.

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present in sight glass	Insufficient refrigerant	Check for leak with gas leak tester
2	No bubbles present in sight glass	No or sufficient refrigerant	Refer to item 3 and 4
3	No temperature difference between compressor inlet and outlet	System is empty or nearly empty	Evacuate and charge system, then check for leak with gas leak tester
4	Temperature between compressor inlet and outlet is noticeably different	Proper or too much refrigerant	Refer to item 5 and 6
5	Immediately after the air conditioner is turned off, refrigerant in sight glass stays clear	Too much refrigerant	Discharge the excess refrigerant to specified amount
6	When the air conditioner is turned off, refrigerant foams and then stays clear	Proper amount of refrigerant	Refrigerant amount is normal



Installation of Manifold Gauge Set

NOTE: Fittings for attaching the manifold gauge set are located on the compressor service valves.

1. CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET

2. INSTALL CHARGING HOSES OF GAUGE SET TO SERVICE VALVES

   Connect the low pressure hose to the suction service valve and the high pressure hose to the discharge service valve. Tighten the hose nuts by hand.

   NOTE: Do not apply compressor oil to the seat of the connection.

Discharging of Refrigeration System

1. CONNECT MANIFOLD GAUGE SET TO COMPRESSOR

2. PLACE FREE END OF CENTER HOSE IN A SHOP TOWEL

3. DISCHARGE SYSTEM

   (a) Slowly open the high pressure hand valve to adjust refrigerant flow. Do not open valve very much.

   CAUTION: If refrigerant is allowed to escape too fast, compressor oil will be drawn out of the system.

   (b) Check the shop towel to make sure no oil is being discharged.

   If oil is present, partially close the hand valve.

   (c) After the manifold gauge reading is below 3.5 kg/cm² (50 psi), slowly open the low pressure valve.

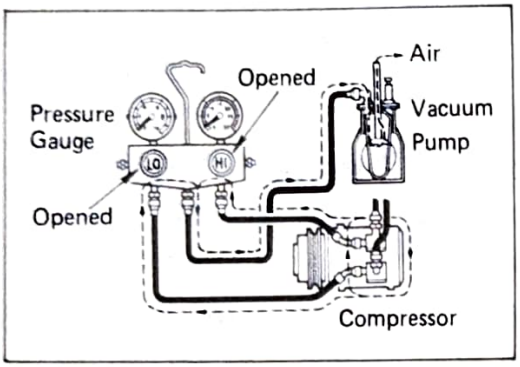
   (d) As the system pressure drops, gradually open both high and low valves until both gauges read 0 kg/cm² (0 psi).

Evacuating and Charging of Refrigeration System

NOTE:

(a) Whenever the air conditioning system has been exposed to the atmosphere, it must be evacuated.

(b) After the installation of a component, the system should be evacuated for approximately 15 minutes. A component in service that has been opened for repair should be evacuated for 30 minutes.



1. EVACUATE SYSTEM

(a) Connect the manifold gauge set. (See page 19-5)

(b) Install the center hose of gauge set on the vacuum pump inlet.

(c) Run the vacuum pump, and then open both hand valves.

(d) After about ten minutes, check that the low pressure gauge reads more than 600 mm Hg (23.62 in. Hg) of vacuum.

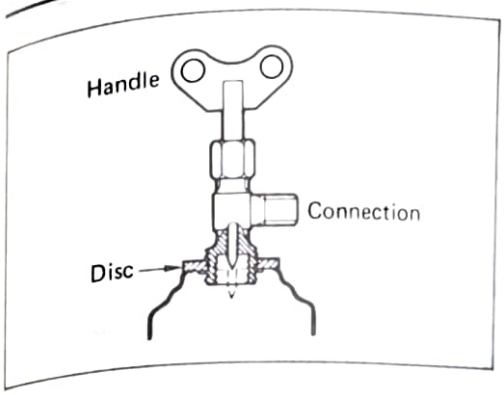
If the reading is not more than 600 mm Hg (23.62 in. Hg), close both valves and stop the vacuum pump. Check the system for leaks and repair as necessary.

If no leaks are found, continue pumping the system down.

(e) After the low pressure gauge indicates more than 700 mm Hg (27.56 in. Hg) of vacuum, continue evacuating for 15 minutes.

(f) Close both hand valves, and stop the vacuum pump. Disconnect the hose from the vacuum pump.

The system is now ready for charging.



2. INSTALL REFRIGERANT CAN TAP VALVE

CAUTION: Observe precautions listed in the front of this section.

(a) Before installing the valve on the refrigerant container, turn the handle counterclockwise until the valve needle is fully retracted.

(b) Turn the disc counterclockwise until it reaches its highest position.

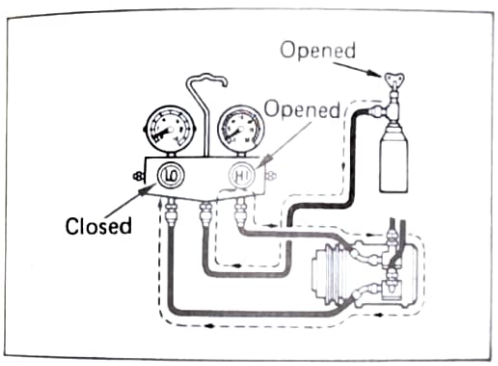
Screw down the valve on the refrigerant container.

(c) Connect the center hose to the valve fitting. Turn the disc fully clockwise by hand.

(d) Turn the handle clockwise to make a hole in the sealed tap.

(e) Turn the handle fully counterclockwise to fill the center hose with air. Do not open the high and low pressure valves.

(f) Loosen the center hose nut connected to the center fitting of the manifold gauge until a hiss can be heard. Allow air to escape for a few seconds, and then tighten the nut.



3. LEAK TEST SYSTEM

NOTE: After finishing the evacuation of the system, check the system for leaks.

(a) Install the refrigerant can tap valve as described in step 2.

(b) Open the high pressure valve to charge the system with refrigerant vapor.

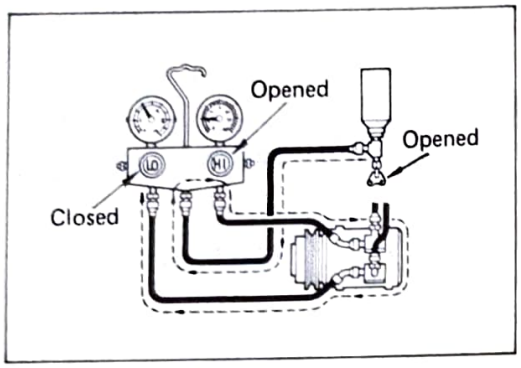
(c) When the low pressure gauge reads 1 kg/cm^2 (14 psi), close the high pressure valve.

(d) Using a halide gas leak detector, propane torch, or electric leak detector, check the system for leaks.

If a leak is found, repair the faulty component or connection.

(e) After checking and repairing the system, perform the following:

- Turn the can tap handle fully clockwise.
- Disconnect the center hose from the can valve fitting.
- Evacuate the system for at least 15 minutes. (see step 1, page 19-6)



4. CHARGE EMPTY SYSTEM (LIQUID)

NOTE: This step is to charge an empty system through the high pressure side with refrigerant in a liquid state. When the refrigerant container is held upside down, refrigerant will enter the system as a liquid.

CAUTION:

- **Never run the engine when charging the system through the high pressure side.**
- **Do not open the low pressure valve when the system is being charged with liquid refrigerant.**

(a) Close both high and low pressure valves completely after the system is evacuated.

(b) Install the refrigerant can tap valve as described in step 2.

(c) Open the high pressure valve fully, and keep the container upside down.

(d) Charge the system with more than one can (400 g, 0.88 lb) to the specified amount. Then, close the high pressure valve.

Specified amount: 650 – 750 g (1.43 – 1.65 lb)

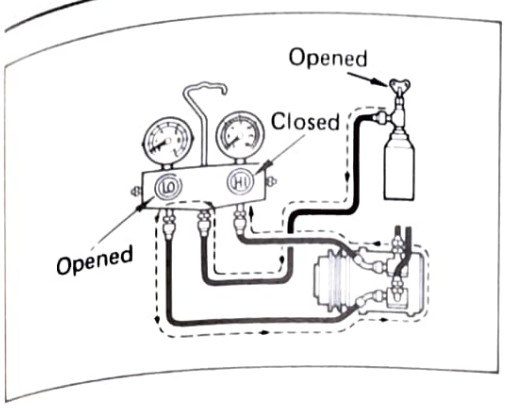
NOTE:

- A fully charged system is indicated by the receiver sight glass being free of any bubbles.
- If the low pressure gauge does not show a reading, the system is blocked and must be repaired.

5. CHARGE EMPTY SYSTEM OR PARTIALLY CHARGED SYSTEM (VAPOR)

NOTE:

- This step is to charge the system through the low pressure side with refrigerant in a vapor state. When the refrigerant container is placed rightside up, refrigerant will enter the system as a vapor.
- Put the refrigerant container in a pan of warm water (maximum temperature 40°C (104°F) to keep vapor pressure in the container slightly higher than the vapor pressure in the system.



(a) Install the refrigerant can tap valve as described in step 2.

(b) Open the low pressure valve. Adjust the valve so that the low pressure gauge does not read over 4.2 kg/cm² (60 psi).

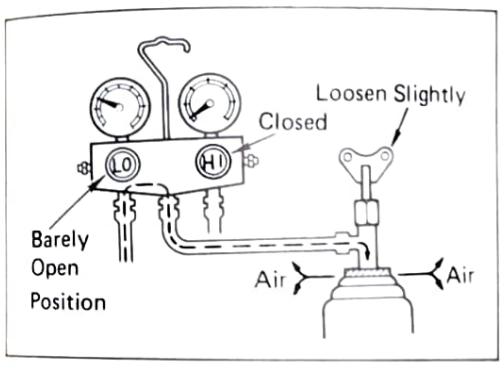
(c) Run the engine at fast idle, and operate the air conditioner.

CAUTION: Be sure to keep the container in the upright position to prevent liquid refrigerant being charged into the system through the suction side. This may damage the compressor.

(d) Charge the system with more than one can (400 g, 0.88 lb) to the specified amount. Then, close the low pressure valve.

Specified amount: 650 – 750 g (1.43 – 1.65 lb)

NOTE: A fully charged system is indicated by the receiver sightglass being free of any bubbles.



6. IF NECESSARY, CHARGE SYSTEM WITH ANOTHER REFRIGERANT CONTAINER

(a) When the refrigerant container is empty, close the pressure valves.

(b) Remove the can tap valve from the container.

(c) Attach the can tap valve to a new refrigerant container.

(d) Purge the air from the center hose by barely opening the low pressure valve and loosening the valve disc.

(e) Make a hole in the sealed tap of the new container and charge the system.

7. WHEN SYSTEM IS FULLY CHARGED, DISCONNECT MANIFOLD GAUGE SET

(a) Close both low and high pressure valves.

(b) Close valve at refrigerant container. If using one pound cans of R-12, allow remaining refrigerant to escape by slowly removing charge line.

(c) Turn off engine.

(d) Using a shop rag, quickly remove both hoses from the compressor service valves.

WARNING: Care must be taken to protect eyes and skin when removing high pressure hose.

(e) Put the cap nuts on the service valve fittings.

Performance Test

1. INSTALL MANIFOLD GAUGE SET

(a) Close the HI and LO hand valves.

(b) Connect the red charging hose to the discharge service valve of the compressor.

(c) Connect the blue charging hose to the suction service valve of the compressor.

2. RUN ENGINE AND OPERATE AIR CONDITIONER

(a) Run the engine at 2,000 rpm.

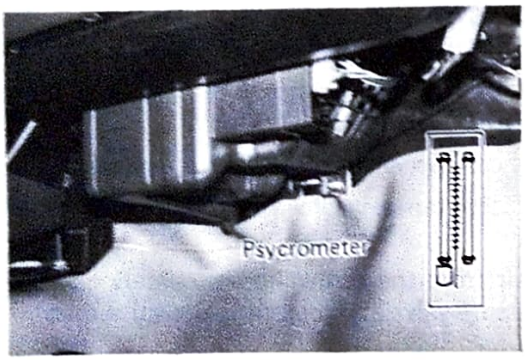
Set the blower switch at HI, temperature level at COOL and air flow control level up.

(b) Keep all windows and doors open.

3. POSITION THERMOMETERS

(a) Place a dry bulb thermometer in the cool air outlet.

(b) Place a psycrometer close to the inlet of the cooling unit.



4. WAIT UNTIL AIR CONDITIONING SYSTEM STABILIZES

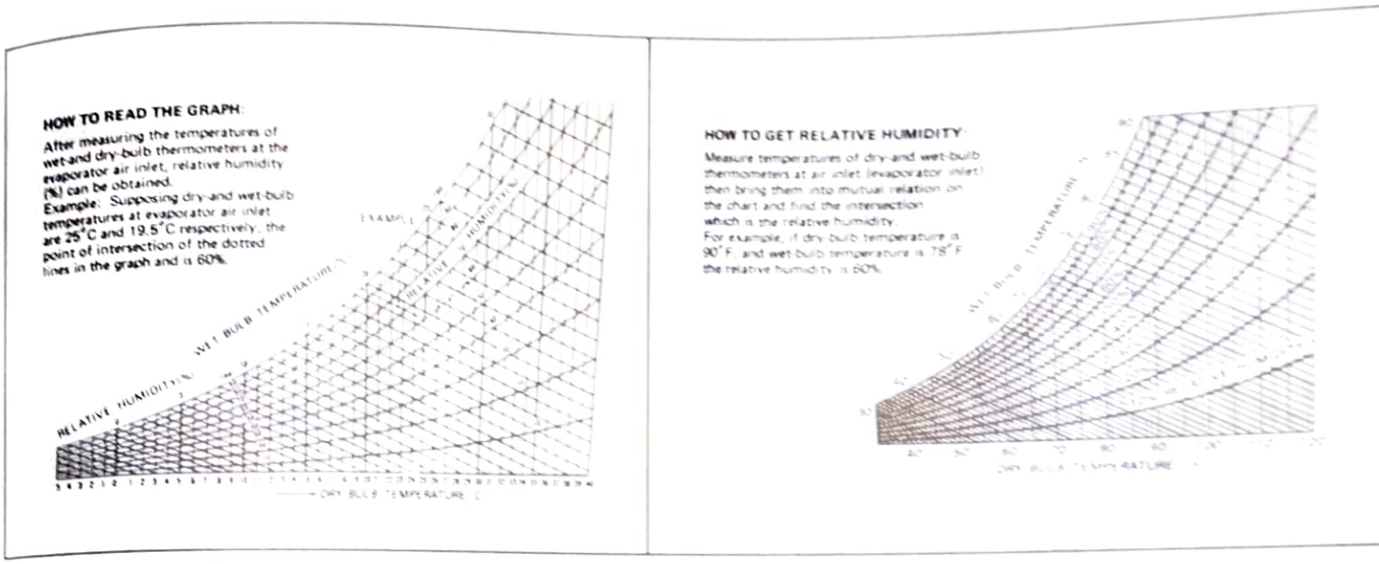
(a) Check that reading on high pressure gauge is 14.0 – 15.5 kg/cm² (199 – 220 psi).

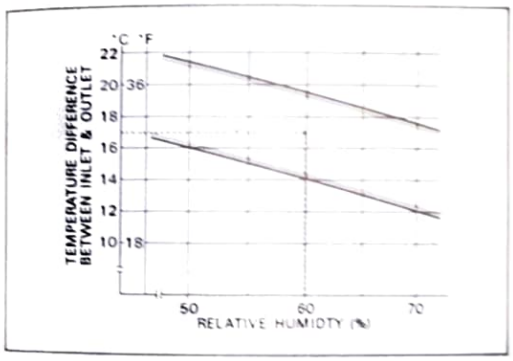
If the reading is too high, pour water on the condenser.
If the reading is too low, cover the front of the condenser.

(b) Check that reading on dry bulb thermometer at the air inlet is 25 – 35°C (77 – 95°F).

5. CHECK PERFORMANCE OF AIR CONDITIONING SYSTEM

(a) Calculate the relative humidity from the psychrometric chart by comparing the wet and dry bulb readings of the psychrometer at the air inlet.



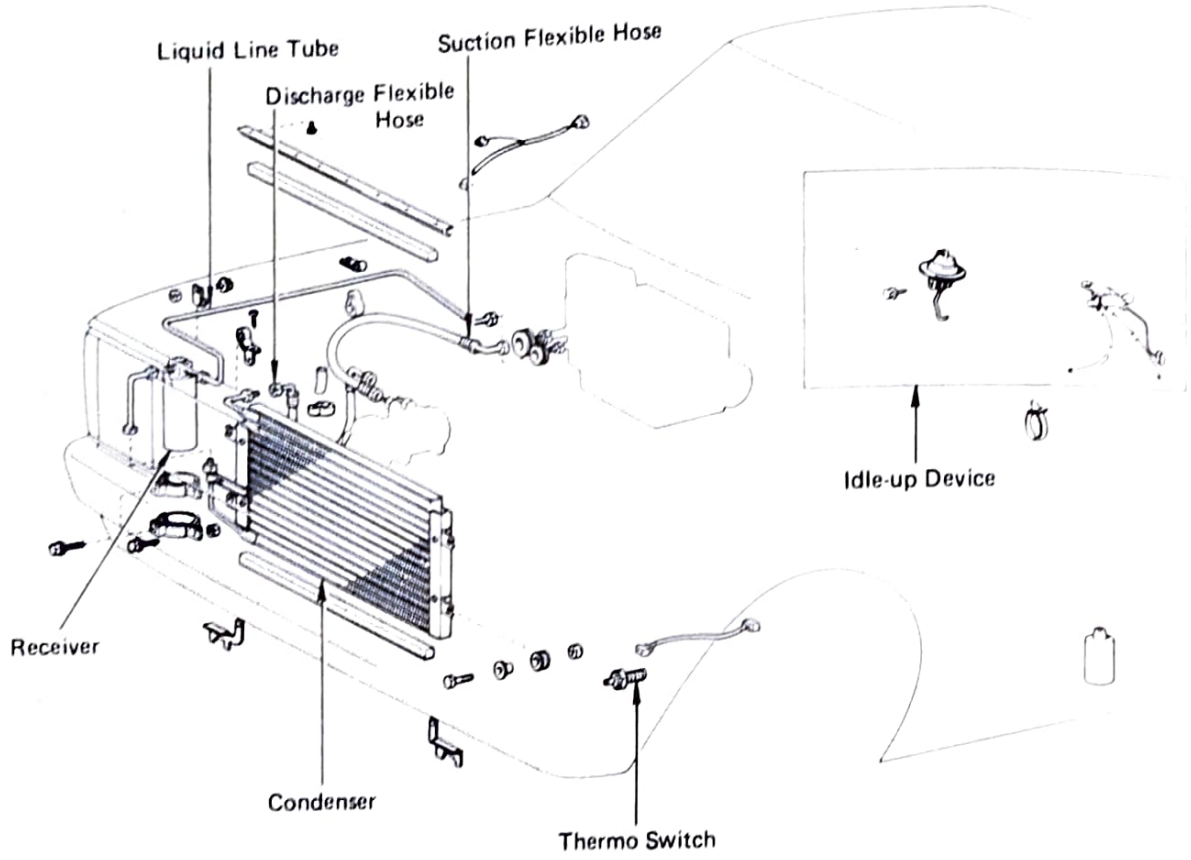


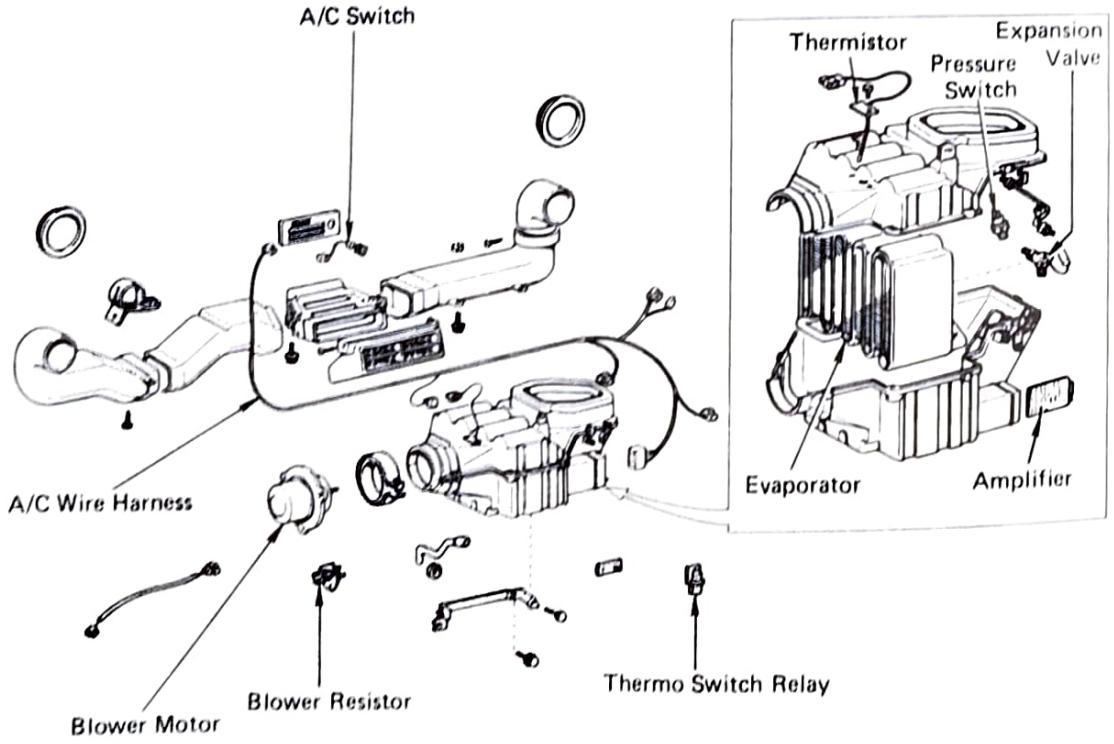
(b) Measure the dry bulb temperature at the cool air outlet, and calculate the difference between the inlet dry bulb and outlet dry bulb temperatures.

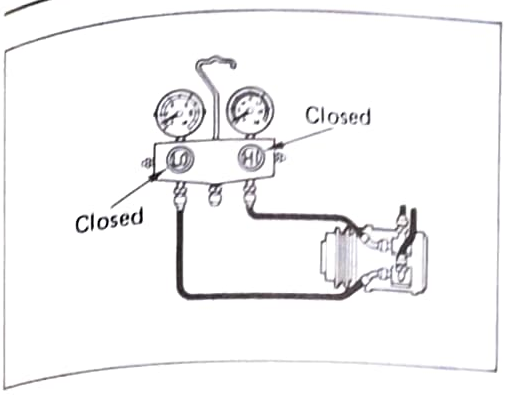
(c) Check that the crossing point of the relative humidity and temperature difference is between the two hatched lines shown.

If the crossing point is within the two lines, the cooling performance is satisfactory.

SYSTEM COMPONENTS







COMPRESSOR
(See illustration on page 19-12)

ON-VEHICLE INSPECTION

1. INSTALL MANIFOLD GAUGE SET
   (a) Close the HI and LO hand valves.
   (b) Connect the red charging hose to the discharge service valve of the compressor.
   (c) Connect the blue charging hose to the suction service valve of the compressor.

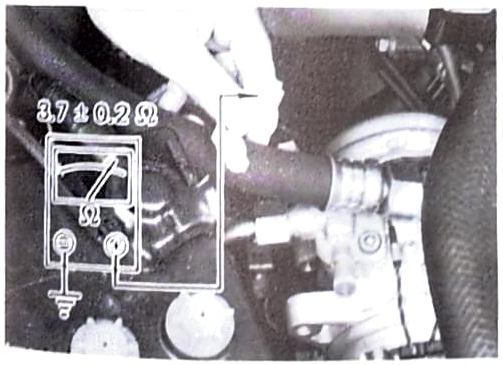
2. RUN ENGINE AT FAST IDLE

3. CHECK COMPRESSOR FOR FOLLOWING:
   (a) High pressure gauge reading is not low and low pressure gauge reading is not higher than normal.
   (b) Metallic sound.
   (c) Leakage from shaft seal.

   NOTE: A slight amount of leakage from the front seal is considered normal.

   If any of the above checks prove faulty, repair the compressor.

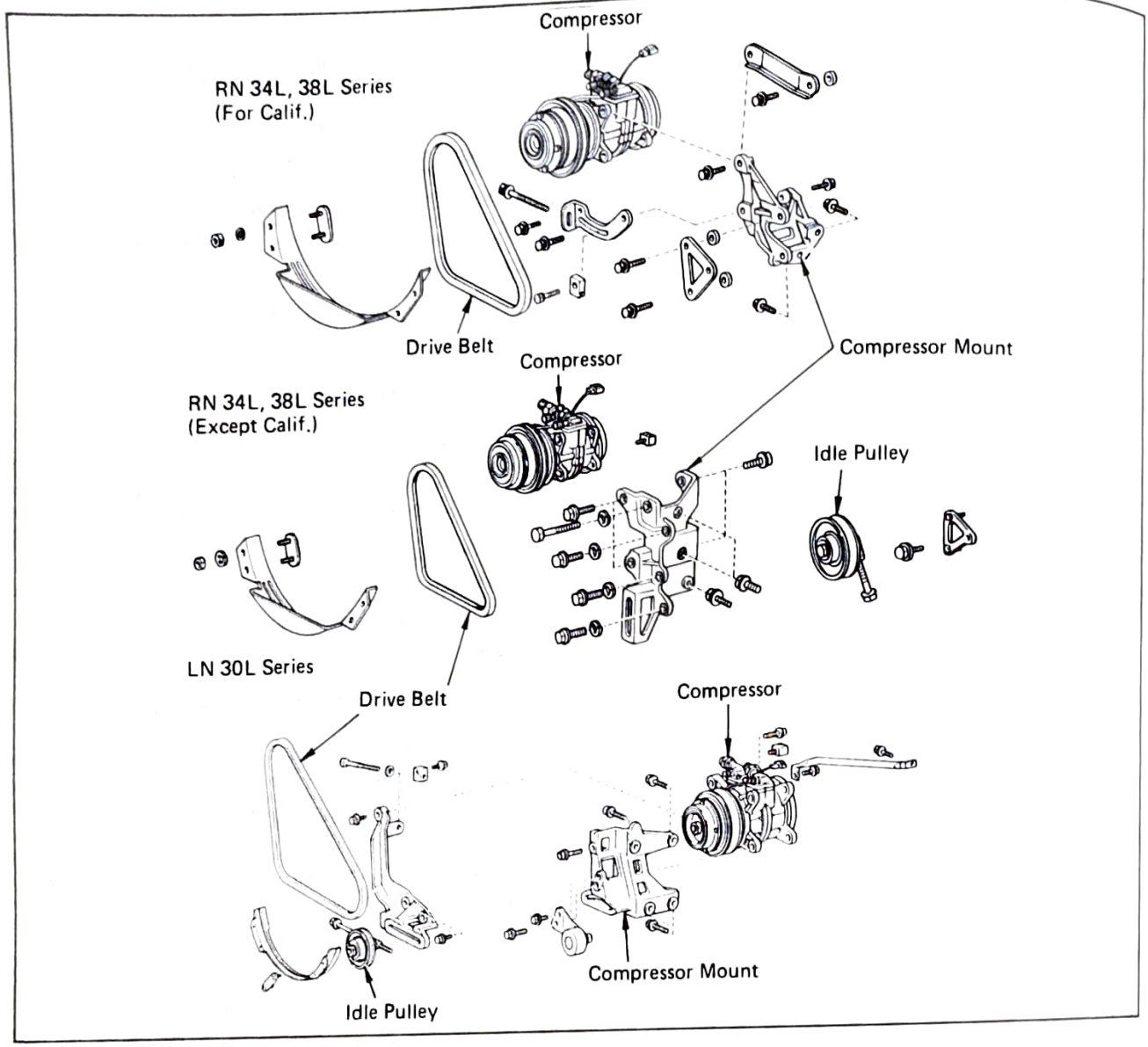
4. CHECK MAGNETIC CLUTCH
   (a) Inspect the pressure plate and the rotor for signs of oil.
   (b) Check the clutch bearings for noise and grease leakage.



   (c) Using an ohmmeter, measure the resistance of the stator coil between the clutch lead wire and ground.

   If the resistance is not within tolerance, replace the coil.

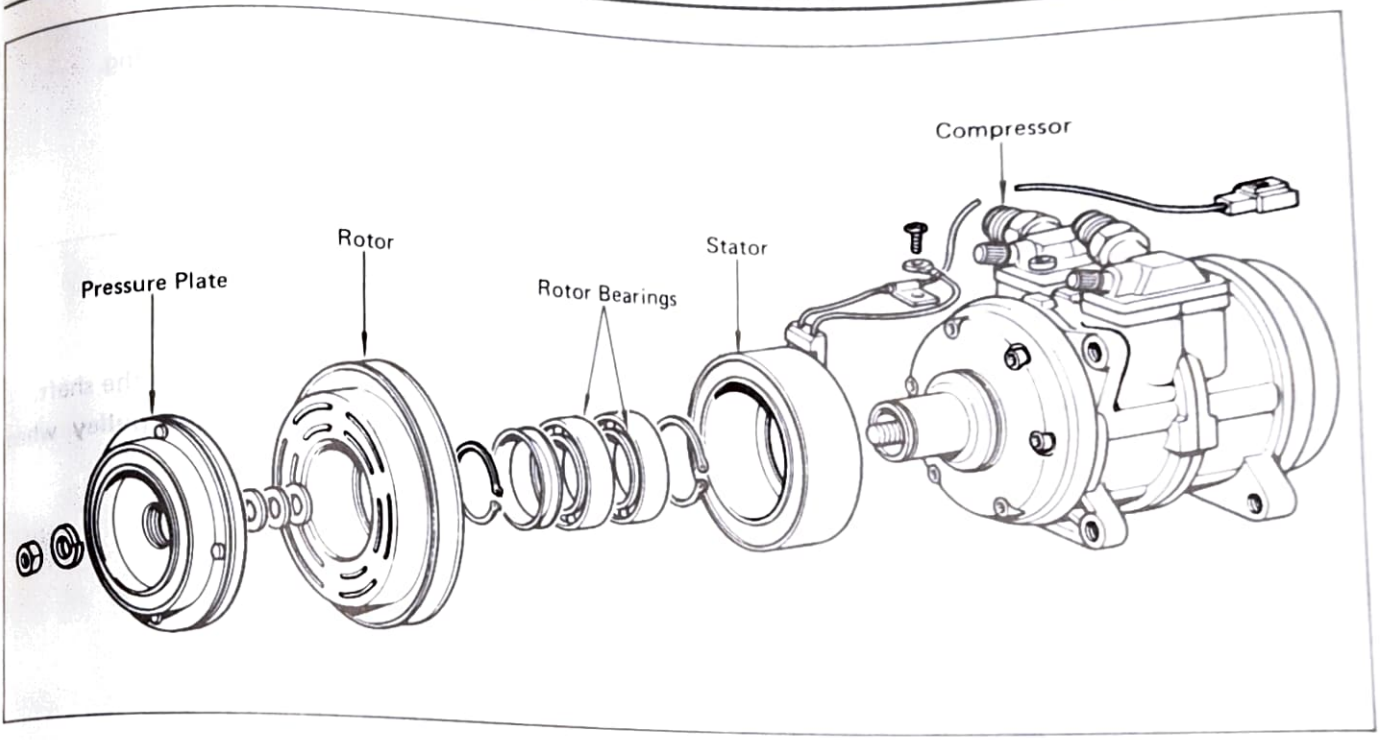
   Standard resistance at 20° C (68° F): 3.7 ± 0.2 ohms

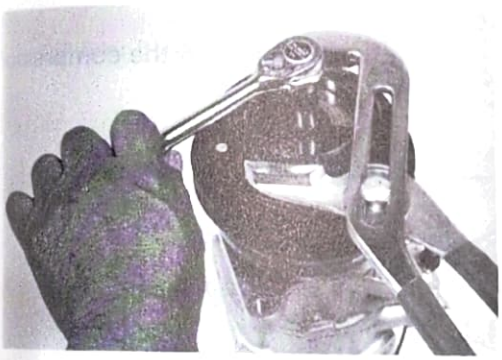


REMOVAL OF COMPRESSOR

1. RUN ENGINE AT IDLE WITH AIR CONDITIONING ON FOR 10 MINUTES
2. DISCONNECT NEGATIVE CABLE FROM BATTERY
3. DISCONNECT CLUTCH LEAD WIRE FROM WIRING HARNESS
4. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM (See page 19-5)
5. DISCONNECT TWO FLEXIBLE HOSES FROM COMPRESSOR SERVICE VALVES

   Cap the open fitting immediately to keep moisture out of the system.
6. REMOVE COMPRESSOR
   (a) Loosen the drive belt.
   (b) Remove the compressor mounting bolts and the compressor.



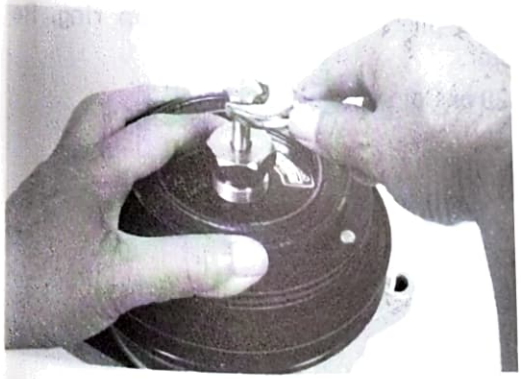


DISASSEMBLY OF MAGNETIC CLUTCH

1. REMOVE PRESSURE PLATE

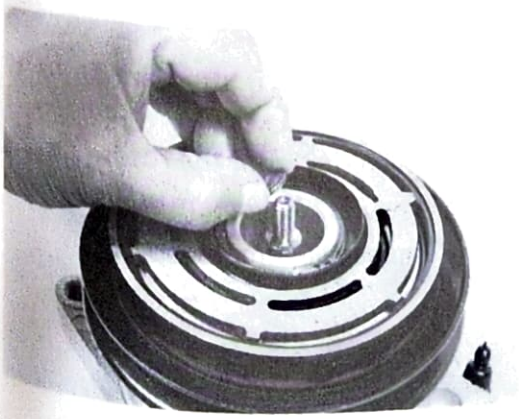
(a) Using a socket and holding bar*, remove the shaft nut.

*SST 07110-77010 or Commercial bar or pliers

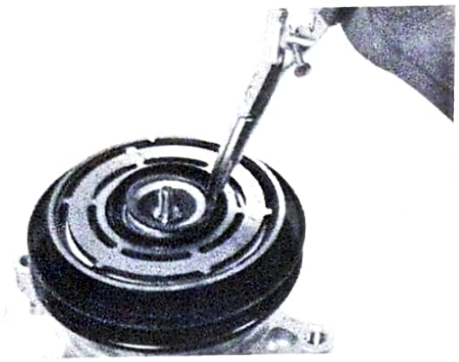


(b) Using a pressure plate remover* and socket, remove the pressure plate.

*SST 07112-71010



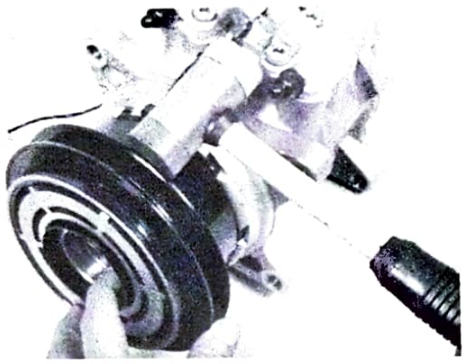
(c) Remove the shims from the shaft.



2. REMOVE ROTOR

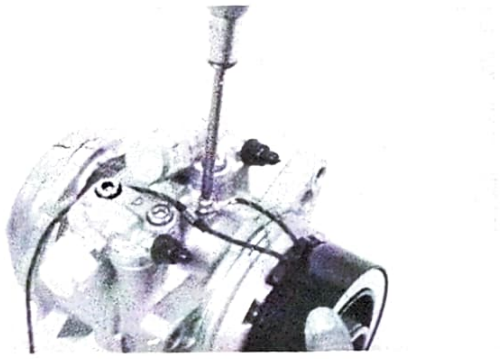
(a) Using snap ring pliers*, remove the snap ring.

*SST 07114-84020 or Commercial pliers



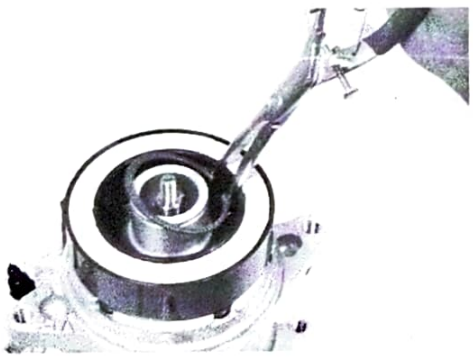
(b) Using a plastic hammer, tap the rotor off the shaft.

CAUTION: Be careful not to damage the pulley when tapping the rotor.



3. REMOVE STATOR

(a) Disconnect the stator lead wires from the compressor housing.



(b) Using snap ring pliers*, remove the snap ring. Remove the stator.

*SST 07114-84020 or Commercial pliers

4. REMOVE ROTOR BEARINGS

NOTE: Press the bearing out only if they are to be replaced.

(a) Remove the bearing snap ring from the rotor.

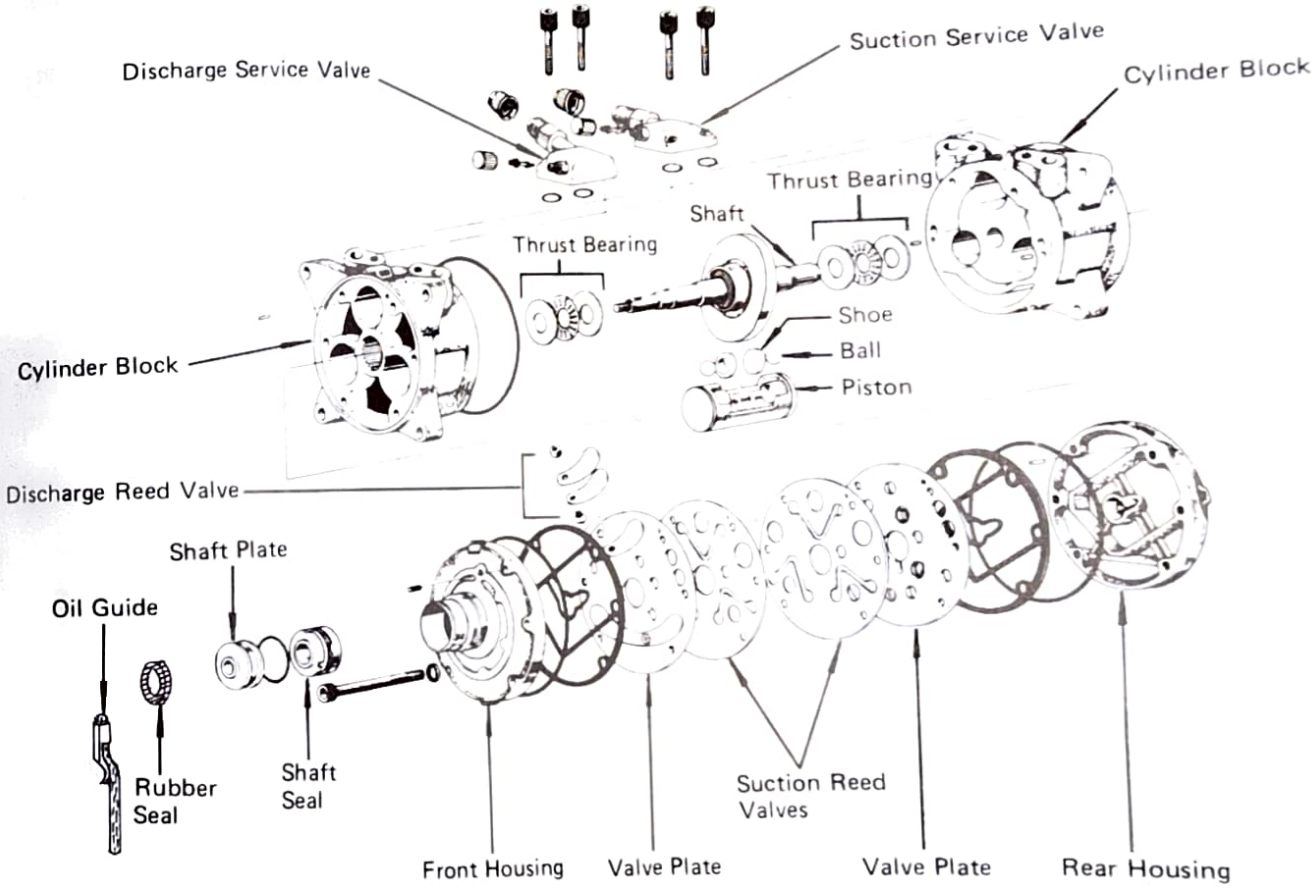
(b) Using two bearing removers*, press out two bearings.

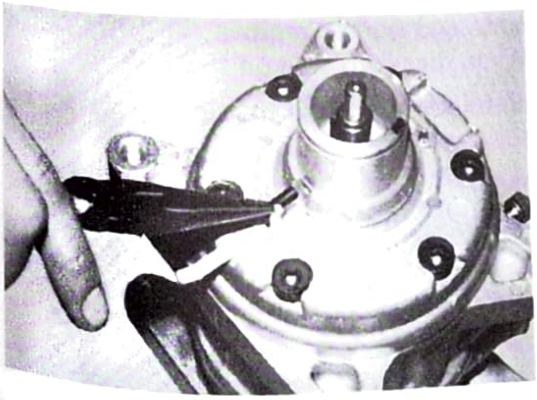
*SST 07110-77011 or Commercial removers

5. INSPECT PRESSURE PLATE AND ROTOR

(a) Inspect the pressure plate and rotor surfaces for wear or scoring. Replace if necessary.

(b) Check the rotor bearings for wear or leakage of grease. Replace if necessary.





DISASSEMBLY OF COMPRESSOR

1. IF NECESSARY, REMOVE OIL GUIDE

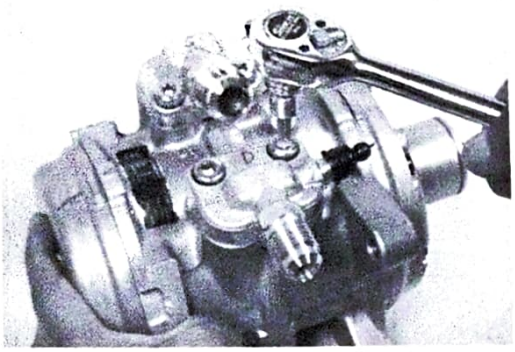
Using pliers, pull out the oil guide (for oil drain).

2. REMOVE KEY

Using a hammer and punch, drive the key from the shaft.

NOTE: If available, use a key remover* to remove the key from the shaft.

*SST 07112-45020

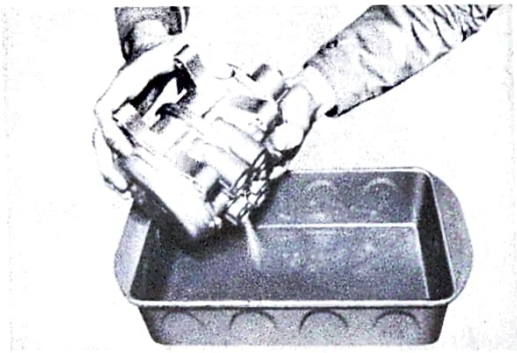


3. REMOVE TWO SERVICE VALVES

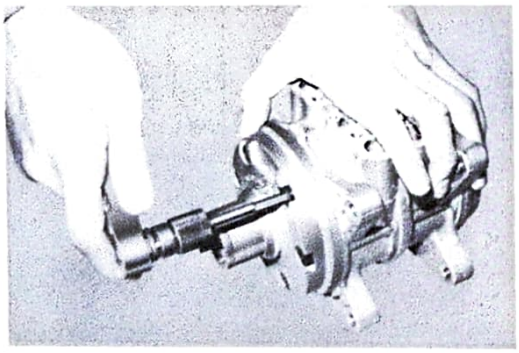
(a) Using a hexagon wrench*, remove the bolts holding two service valves.

(b) Remove the O-rings from the service valves and discard them.

*SST 07110-61050 or Commercial wrench



4. DRAIN OIL INTO CONTAINER

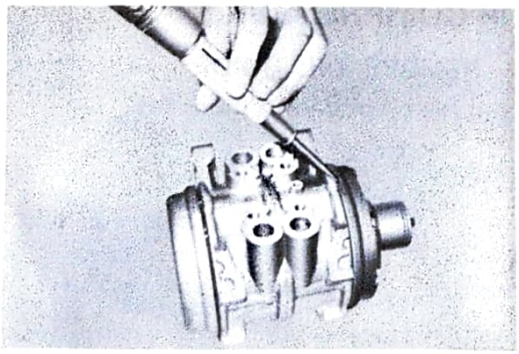


5. REMOVE FRONT HOUSING

(a) Using a hexagon wrench*, remove six through bolts.

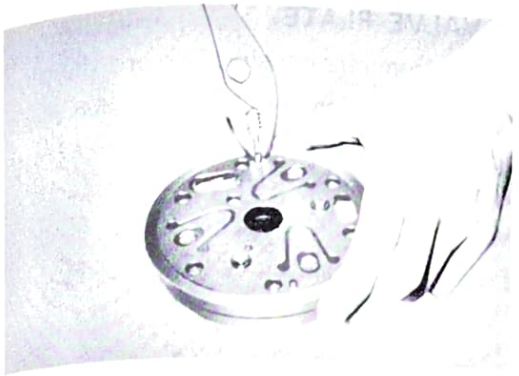
NOTE: Do not reuse the six washers.

*SST 07110-61050 or Commercial wrench



(b) Using a hammer and punch, remove the front housing by tapping on the protrusion on the front housing.

CAUTION: Be careful not to scratch the sealing surface of the front housing.

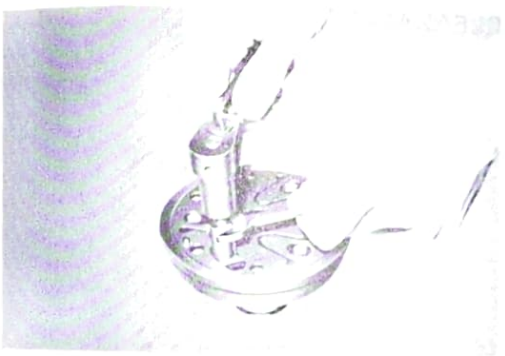


6. REMOVE FRONT VALVE PLATE

(a) Remove two pins from the front housing. Discard the pins.

(b) Install the valve plate removing tool* in the valve plate.

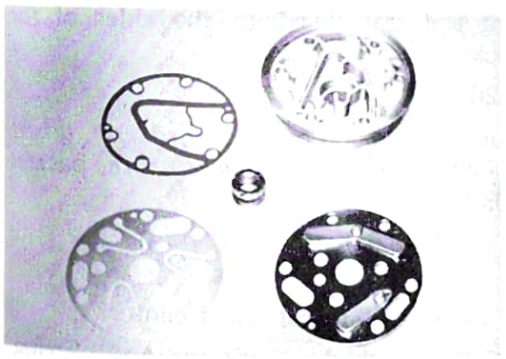
*SST 07112-35010 or Commercial tool



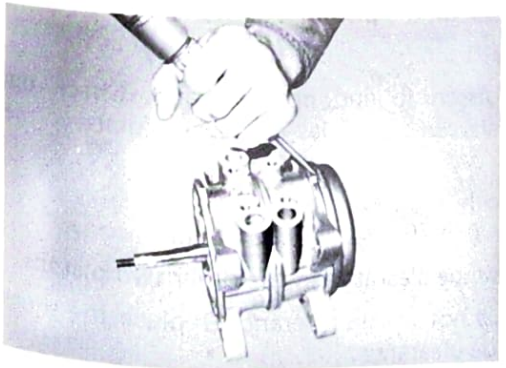
(c) Using removing tool, remove the valve plate.

CAUTION:

- Remove the seal plate only if it is to be replaced. Pushing the seal plate on to the lapping surface will damage it.
- Be sure to handle the shaft seal carefully, and do not scratch the carbon seal.



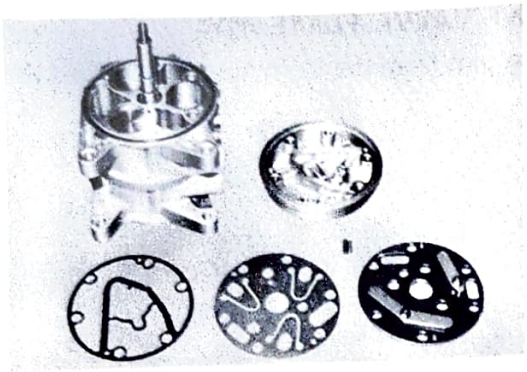
(d) Remove the suction valve, valve plate, gasket and shaft seal.



7. REMOVE REAR HOUSING

Using a hammer and punch, remove the rear housing by tapping on the protrusion on the rear housing.

CAUTION: Be careful not to scratch the sealing surface of the rear housing.



8. REMOVE REAR VALVE PLATE

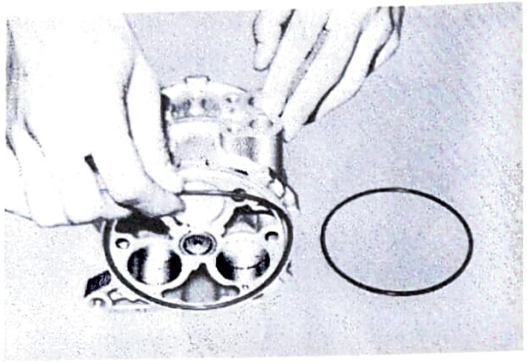
(a) Remove two pins from rear housing. Discard the pins.

(b) Install valve plate removing tool* in the valve plate. After installing the removing tool, turn the tool 90°.

*SST 07112-35010 or Commercial tool

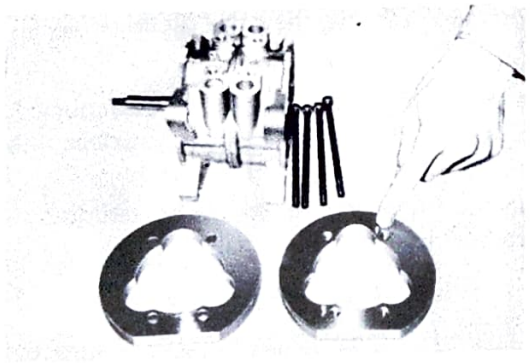
(c) Using removing tool, remove the valve plate.

(d) Remove the suction valve, valve plate and gasket.



9. REMOVE FRONT AND REAR O-RINGS FROM CYLINDER BLOCK

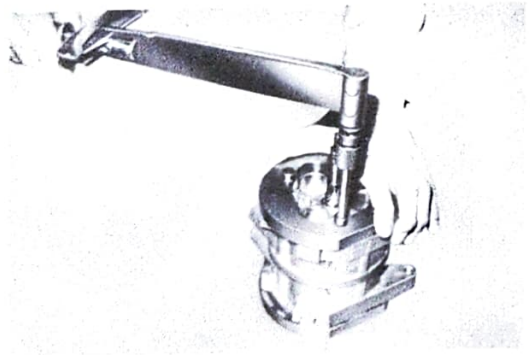
Discard the O-rings.



10. CHECK SHOE CLEARANCE

(a) Install two pins in rear ring*.

*SST 07115-25020



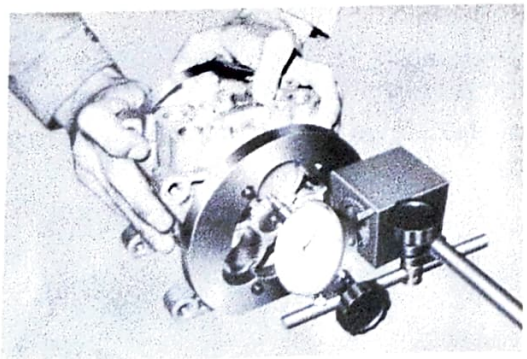
(b) Attach front and rear rings* to the sides of the cylinder blocks.

*SST 07115-25020

(c) Using a torque wrench and hexagon wrench*, gradually tighten four through bolts in two or three passes.

*SST 07110-61050 or Commercial wrench

Torque: 2.5 – 2.7 kg-m (18.1 – 19.5 ft-lb)



(d) Set one of the pistons to top dead center.

(e) Set magnet stand with dial indicator on the ring* with its needle on the piston.

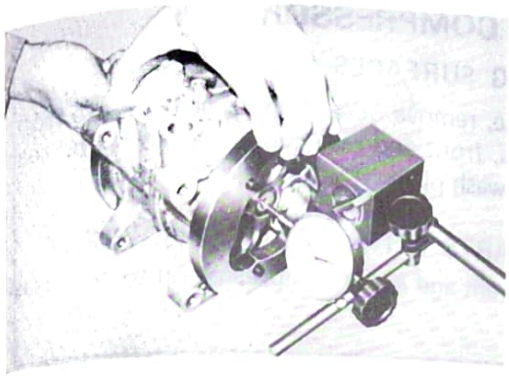
*SST 07115-25020

(f) Move the piston in and out by hand. Check the clearance between the shoes and swash plate of the shaft.

Standard clearance: 0.005 – 0.025 mm (0.0002 – 0.0010 in.)

(g) Measure the shoe clearance of the other two pistons.

If the clearance is not within tolerance, replace the shoes and adjust the shoe clearance.



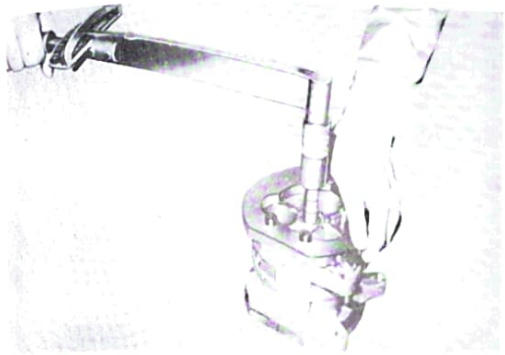
11. CHECK SHAFT CLEARANCE

(a) Set the needle of the dial gauge on the front end of the shaft.

(b) Move the shaft in and out along its axis. Check the shaft clearance.

Standard clearance: 0

If any clearance exists, replace the thrust bearings.



12. CHECK SHAFT ROTATING TORQUE

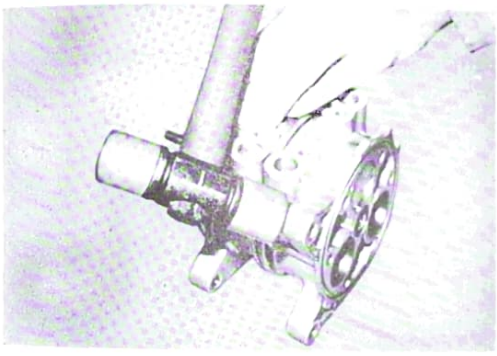
(a) Install key and key installing tool* on the shaft.

*SST 07114-45010

(b) Using a torque wrench, measure the starting torque three or four times and use the average.

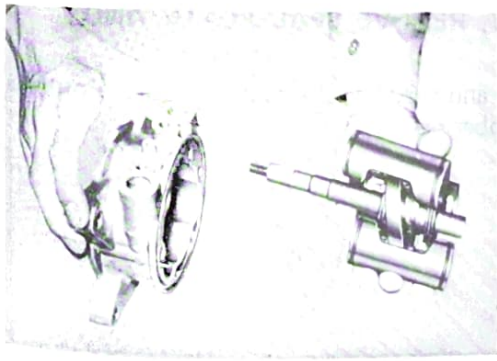
Specified starting torque: Less than 0.5 kg-m (43 in.-lb)

If the torque is not less than specified, disassemble the cylinder block and adjust the shoe clearance.



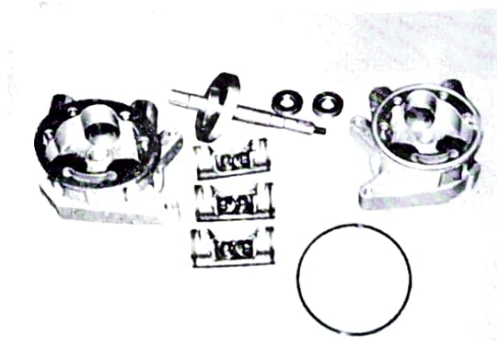
13. IF NECESSARY, DISASSEMBLE CYLINDER BLOCKS

(a) Using a plastic hammer, carefully tap the rear half of the cylinder block to separate it from the front half.



(b) Mark the piston heads with a felt pen to assure correct reassembly.

(c) Remove the shaft and pistons by pushing up on the shaft.



(d) Remove and discard the O-ring.

(e) Remove the pistons with balls and shoes.

NOTE: Be sure not to change the combination of pistons, balls and shoes.

(f) Remove the thrust bearings.

INSPECTION OF COMPRESSOR

1. CLEAN SLIDING SURFACES

Using an oil stone, remove oil dirt and rust from the front and rear housings, front and rear cylinders, front and rear valve plates and swash plate.

2. CLEAN ALL PARTS WITH CLEANING SOLVENT

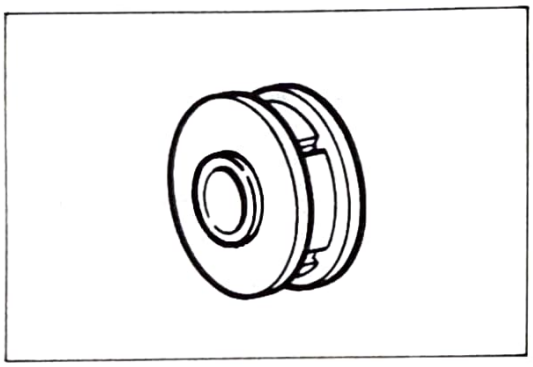
Wipe off the solvent and apply compressor oil to the disassembled parts.

3. INSPECT SHAFT SEAL

(a) Check the lapping surface of carbon disc for cracks or scratches.

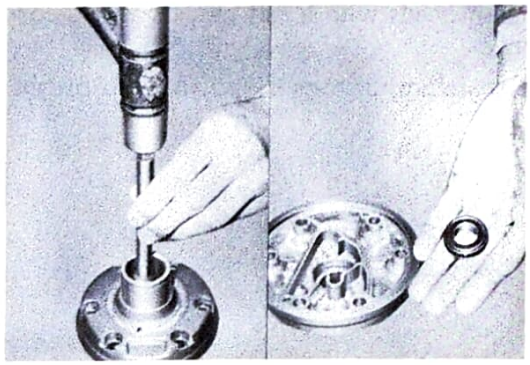
(b) Check the O-ring for cracks or hardening.

(c) Check the spring action.



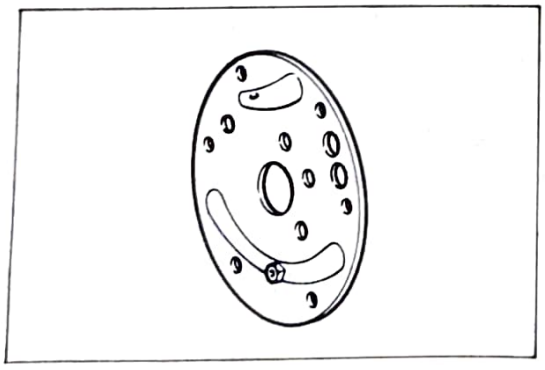
4. INSPECT SEAL PLATE

Check the sealing surfaces for scratches or corrosion.



5. IF NECESSARY, REMOVE SEAL PLATE AND RUBBER SEAL

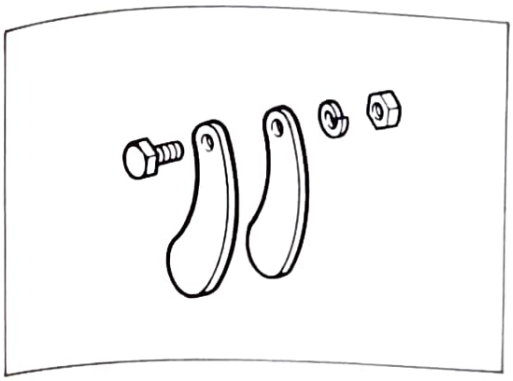
Using a hammer and a 20 mm diameter rod, drive out the seal plate and rubber seal.



6. INSPECT VALVE PLATES

Check both surfaces for scratches and corrosion.

If plates are scratched or corroded, disassemble plates and polish them with a fine oil stone or replace them (See step 8, page 19-23).



7. INSPECT REED VALVES

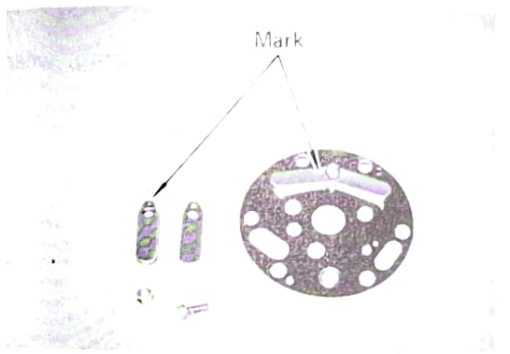
(a) Check the reed for cracks, scratches, deformation or corrosion.

(b) Check the restrainer for deformation or corrosion.

If valves are damaged, disassemble the valve plate and replace the valves (See step 8).

8. IF NECESSARY, DISASSEMBLE AND ASSEMBLE VALVE PLATE

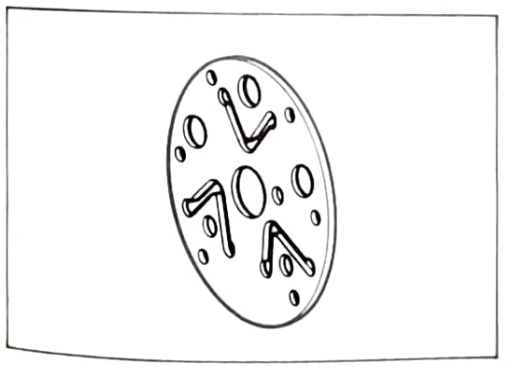
(a) Remove the restrainers and discharge reed valve from the valve plate.



(b) Assemble the reed valve and retainer on the valve plate with the mark as shown.

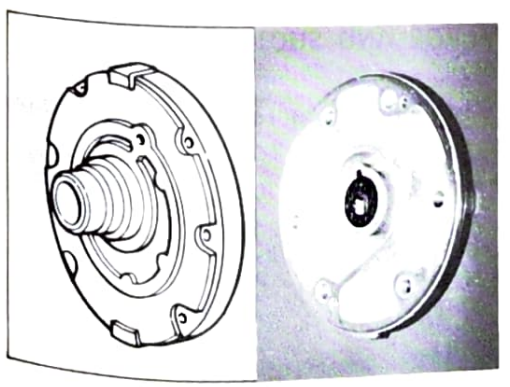
(c) Torque the nut and bolt.

Torque: 0.4 – 0.5 kg-m (35 – 43 in.-lb)



9. INSPECT SUCTION VALVES

Check the reed for cracks, scratches, deformation or corrosion.

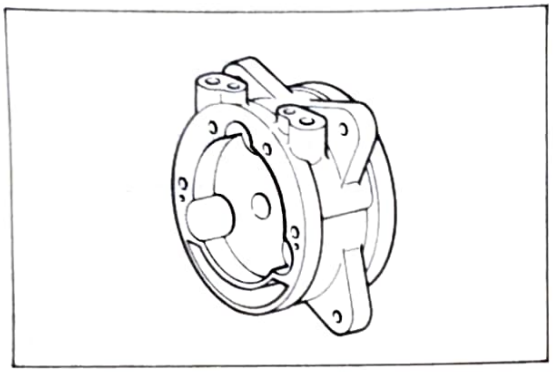


10. INSPECT FRONT AND REAR HOUSINGS

(a) Check the sealing surfaces for cracks, scratches or deformation.

(b) Check the oil pump housing for wear or scoring.

(c) Check the oil pump for wear, scoring or corrosion.

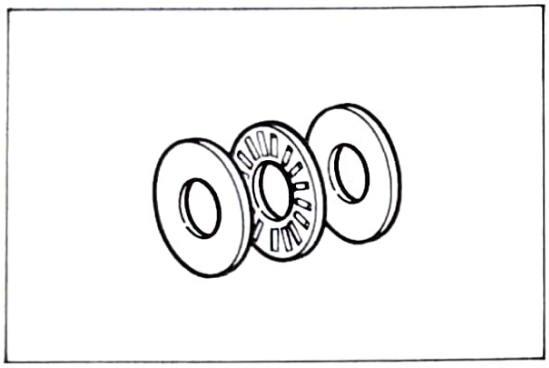


11. INSPECT CYLINDER BLOCKS

(a) Check the cylinder bore for scratches or corrosion.

(b) Check the radial bearings for poor contact, worn-out needle, scoring or pits.

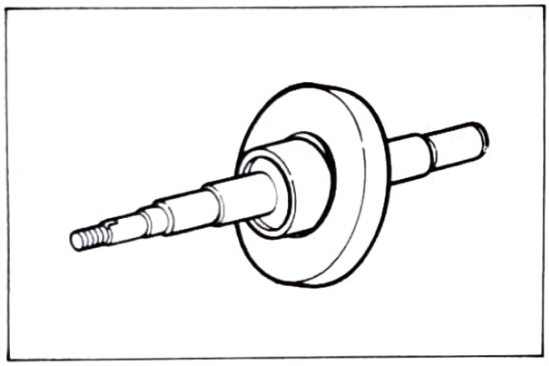
(c) Check the mating surfaces between the front and rear cylinder blocks for cracks or scratches.



12. INSPECT THRUST BEARINGS

(a) Check the races and rollers for pits, scoring or flaking.

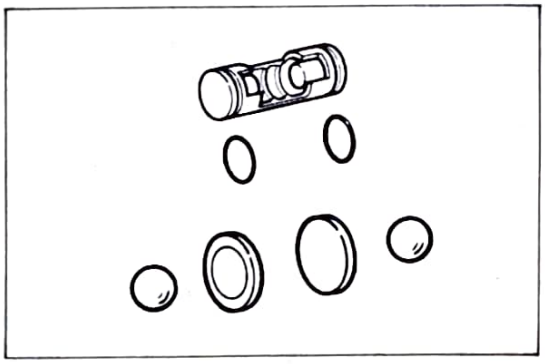
(b) Check the bearings for abnormal wear or corrosion.



13. INSPECT SHAFT

(a) Check the surface of swash plate for scoring, wear or signs of uneven shoe contact.

(b) Check the shaft for wear or deformation.



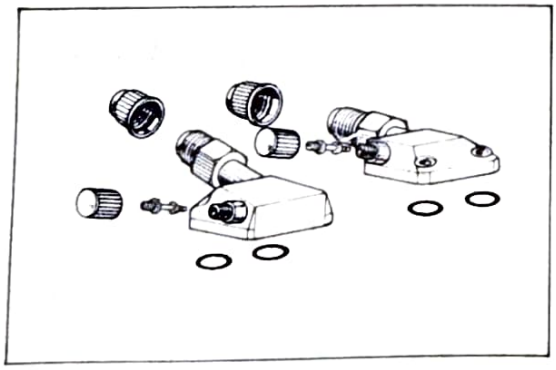
14. INSPECT PISTONS, SHOES AND BALLS

(a) Check the machined surface for scratches or scoring.

(b) Check the piston clearance.

(c) Check the shoe for wear or cracks.

(d) Check the ball for flaking or wear.



15. INSPECT DISCHARGE AND SUCTION SERVICE VALVES

(a) Check the flare portion for scratches and deformation.

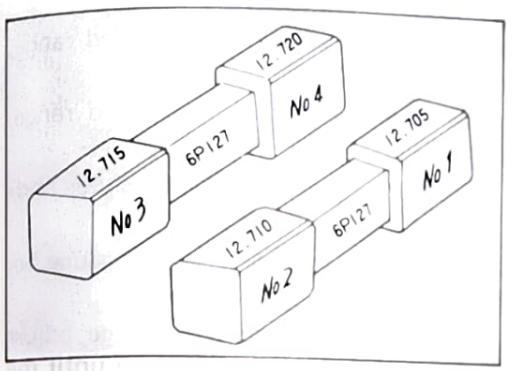
(b) Check the groove for O-ring for cracks or scratches.

(c) Check the schrader valve for gas leakage.

ASSEMBLY OF COMPRESSOR
(See illustration on page 19-17)

NOTE:

- Do not reuse gaskets, O-rings or washers. Use the overhaul gasket kit.
- Before starting the assembly procedure, make sure all parts and workbench are clean.

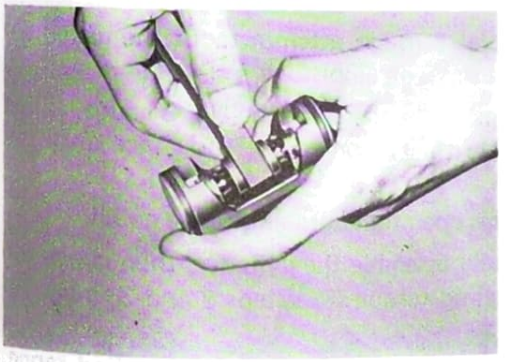


1. ADJUST SHOE CLEARANCE

When adjusting the shoe clearance, select and use a suitable shoe gauge* according to the following selection table.

*SST 07115-15030

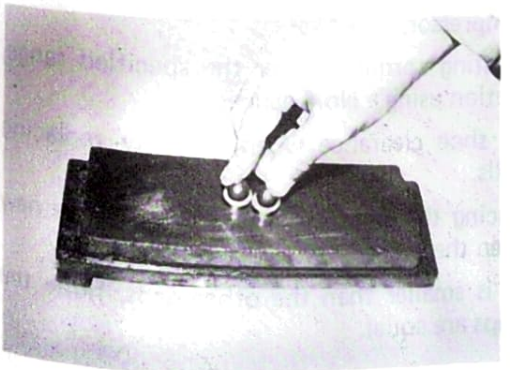
Shoe gauge	Applications
No. 1	When using the old shaft of which swash plate is rather worn. (See step 1 (a), page 19-26)
No. 2	When assembling the old shaft, pistons, balls and new shoes. (See step 1 (b) or 1 (d), page 19-26)
No. 3	When replacing the shaft, pistons, balls and shoes with new parts. (See step 1 (c), page 19-26)
No. 4	When adjusting the shoe clearances with No. 3 gauge if shaft rotating torque of compressor is larger than standard.



NOTE:

- When checking the shoe clearance, coat the shoes and shoe gauge with compressor oil.

  Compressor oil: DENSOIL 6, SUNISO No. 5GS, or equivalent



- When honing the shoe faces, lubricate the oil stone with compressor oil.

(a) Adjust the shoe clearance when using the old shaft of which swash plate is rather worn.

- Using a No. 1 gauge, attempt to fit the gauge between the shoes on all pistons.
- If the gaps are smaller than the No. 1 gauge, adjust the gaps to fit by honing the shoe face until the gauge fits.
- Repeat this operation until all fits are equal.
- Temporarily assemble the cylinder, then check the shaft rotating torque (See steps 2 and 3, page 19-27).

If the shaft rotating torque is within the specified range, assemble the compressor.

If the shaft rotating torque is over the specified range, repeat this operation using No. 2 gauge.

(b) Adjust the shoe clearance when replacing shoes and/or balls.

- Using a No. 2 gauge, attempt to fit the gauge between the shoes on all pistons.
- If the gaps are smaller than the No. 2 gauge, adjust the gaps to fit by honing the shoe face until the gauge fits.
- Repeat this operation until all fits are equal.
- Temporarily assemble the cylinder, then check the shaft rotating torque (See steps 2 and 3, page 19-27).

If the shaft rotating torque is within the specified range, assemble the compressor.

If the shaft rotating torque is over the specified range, repeat this operation using a No.3 or No.4 gauge.

(c) Adjust the shoe clearance when replacing the shaft, pistons, balls and shoes.

- Using a No. 3 gauge, attempt to fit the gauge between the shoes on all pistons.
- If the gaps are smaller than the No. 3 gauge, adjust the gaps to fit by honing the shoe face until the gauge fits.
- Repeat this operation until all fits are equal.
- Temporarily assemble the cylinder, then check the shaft rotating torque (See steps 2 and 3, page 19-27).

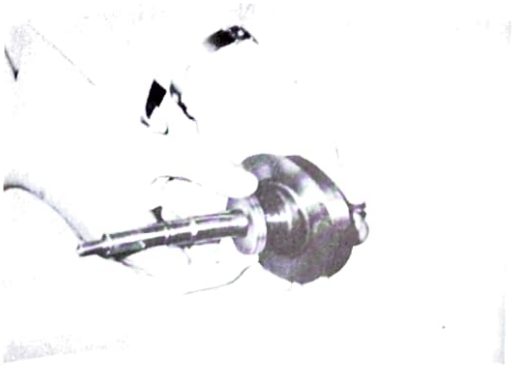
If the shaft rotating torque is within the specified range, assemble the compressor.

If the shaft rotating torque is over the specified range, repeat this operation using a No.4 gauge.

(d) Adjust the shoe clearance when partially replacing shoes or balls.

After replacing the shoes or balls, measure the new gaps between the shoes.

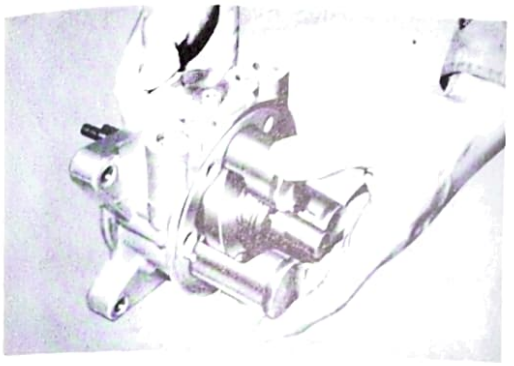
If the new gap is smaller than the other gaps, hone the shoes until all gaps are equal.



2. ASSEMBLE CYLINDER BLOCK

(a) Lubricate the swash plate of the shaft, thrust bearings, pistons, balls, shoes and radial bearings of cylinder with clean compressor oil.

(b) Install the thrust bearings on the shaft.

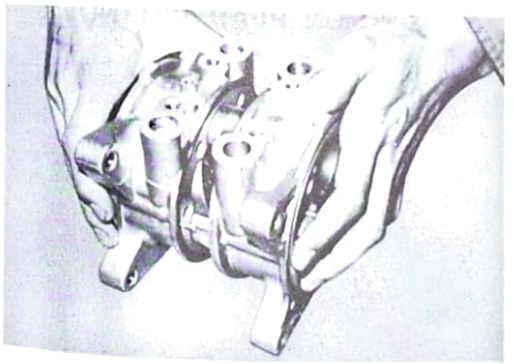


(c) Install the pistons on the swash plate of the shaft.

(d) Insert the shaft and piston assemblies into the front cylinder.

NOTE: Make sure the pistons are inserted in their cylinders marked during disassembly.

(e) Lubricate a new O-ring with compressor oil. Install the O-ring in the front cylinder.

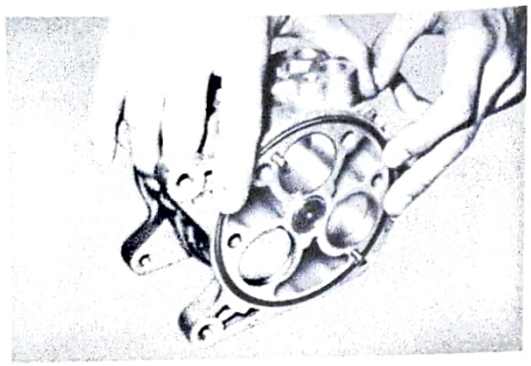


(f) Assemble the rear and front cylinders.

3. CHECK SHOE CLEARANCE, SHAFT CLEARANCE AND SHAFT ROTATING TORQUE

Perform steps 10 through 12, page 19-20.

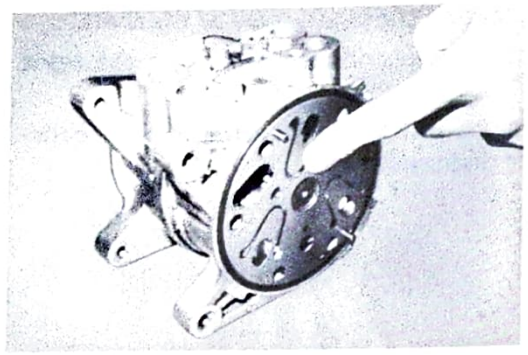
Adjust the shoe clearance as necessary.



4. INSTALL REAR VALVE PLATE ON REAR CYLINDER

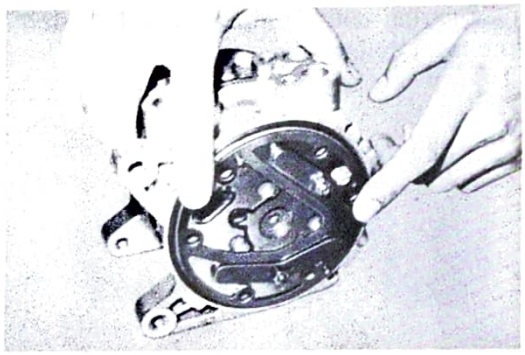
(a) Install two pins in the rear cylinder.

(b) Lubricate a new O-ring with compressor oil. Install the O-ring in the rear cylinder.



(c) Install the rear suction valve over the pins on the rear cylinder.

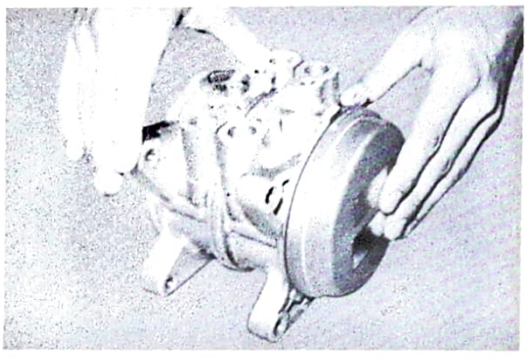
NOTE: Front and rear suction valves are the same.



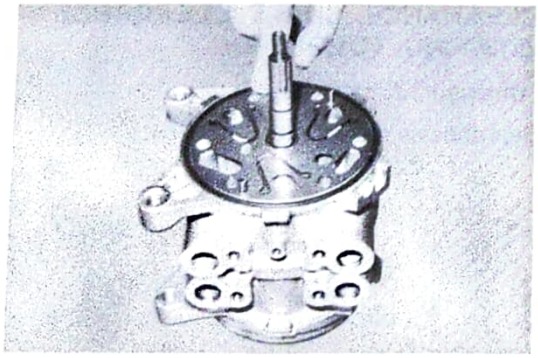
(d) Install the rear valve plate over the pins on the rear cylinder.

NOTE: Rear valve plate is marked "R".

(e) Lubricate the gasket with compressor oil. Install the gasket on the valve plate.



5. INSTALL REAR HOUSING ON REAR CYLINDER

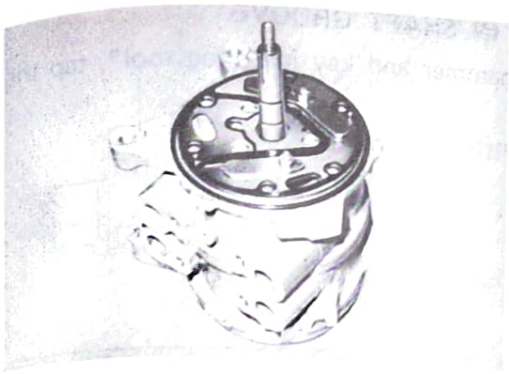


6. INSTALL FRONT VALVE PLATE ON FRONT CYLINDER

(a) Install two pins in the front cylinder.

(b) Lubricate a new O-ring with compressor oil. Install the O-ring in the rear housing.

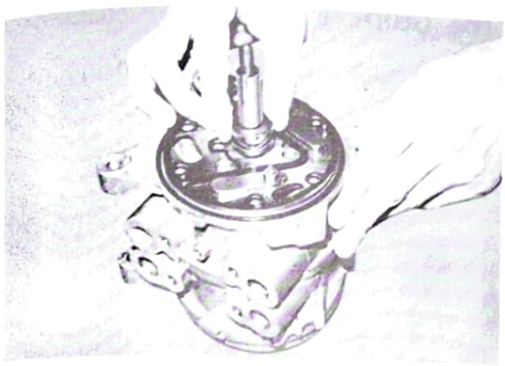
(c) Install the front suction valve over the pins on the front cylinder.



(d) Install front valve plate over the pins on the front cylinder.

NOTE: The front valve plate is marked "F".

(e) Lubricate the gasket with compressor oil. Install the gasket on the valve plate.

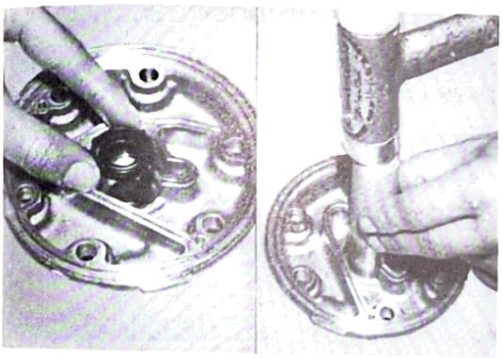


7. INSTALL SHAFT SEAL

(a) Lubricate the shaft seal with compressor oil. Install the shaft seal on the shaft.

(b) Lubricate the carbon ring with compressor oil. Install the carbon ring on the shaft.

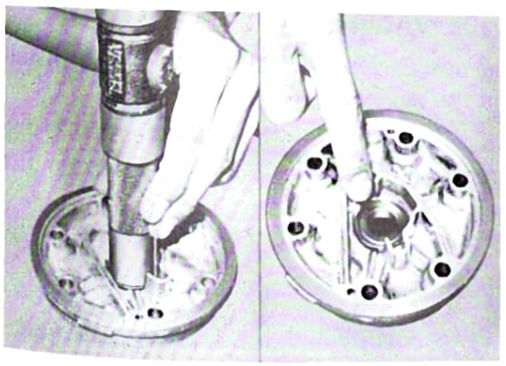
NOTE: Do not touch the seal surface of the carbon ring with your fingers.



8. IF SEAL PLATE WAS REMOVED, INSTALL NEW RUBBER SEAL AND SEAL PLATE

(a) Using a driver* and plastic hammer, tap in the new rubber seal.

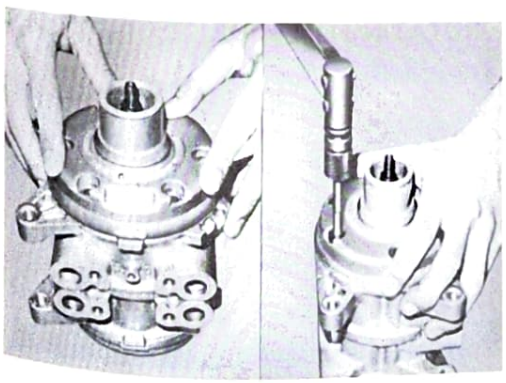
*SST 07114-34010 or Commercial driver



(b) Lubricate the seal plate and new O-ring with compressor oil. Install the seal plate and O-ring in the front housing with your fingers.

(c) Using a plastic hammer and driver*, tap in the seal plate.

*SST 07114-35010 or Commercial driver

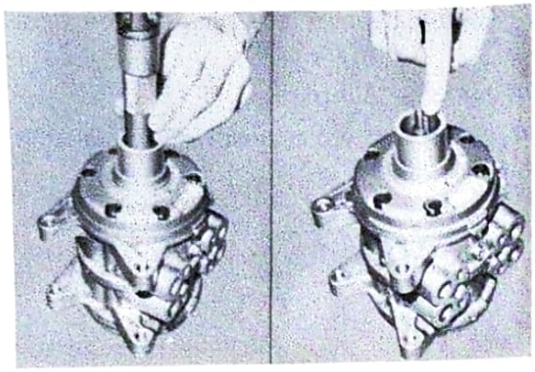


9. INSTALL FRONT HOUSING ON FRONT CYLINDER AND TIGHTEN SIX THROUGH BOLTS

Using a torque wrench and hexagon wrench*, gradually tighten six through bolts in two or three passes.

*SST 07110-61050 or Commercial wrench

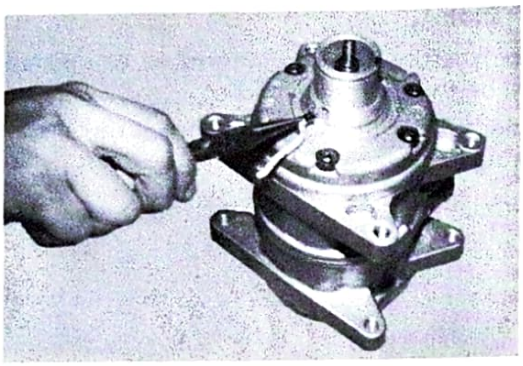
Torque: 2.5 – 2.7 kg-m (18.1 – 19.5 ft-lb)



10. INSTALL KEY IN SHAFT GROOVE

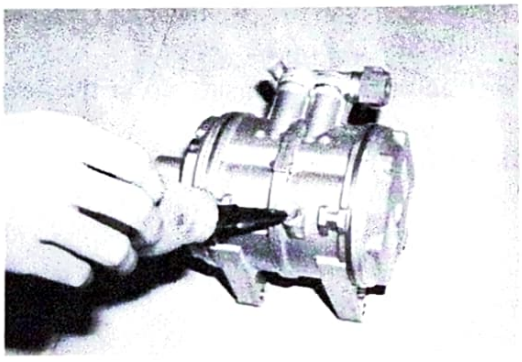
Using a plastic hammer and key installing tool*, tap the key lightly.

*SST 07114-45010



11. INSTALL NEW OIL GUIDE INTO FRONT HOUSING

Using pliers, push the oil guide into the front housing.



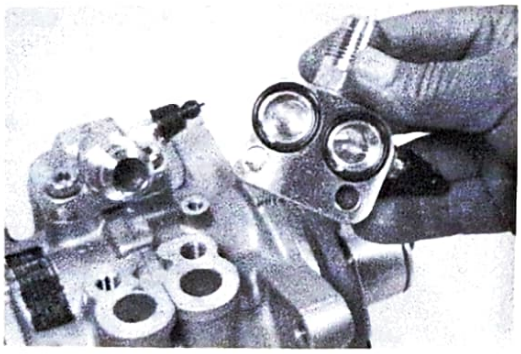
12. POUR COMPRESSOR OIL INTO COMPRESSOR

Compressor oil: **DENSOIL 6, SUNISO** No.5GS, or **equivalent**

Compressor oil capacity: **100 – 130** cc (6.1 – 7.9 cu in.)

After filling with compressor oil, install the oil plug using a torque wrench.

Torque: **1.0 – 1.4 kg-m (7.2 – 10.1 ft-lb)**



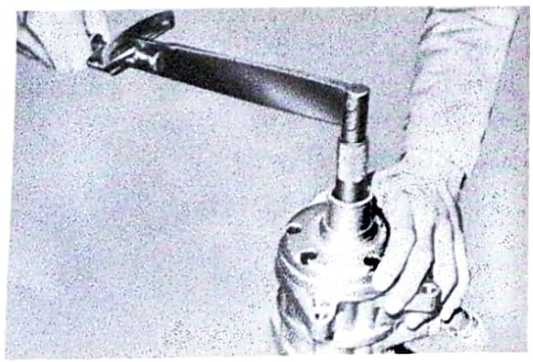
13. INSTALL SERVICE VALVES

(a) Lubricate the new O-rings with compressor oil. Install the O-rings in the service valves.

(b) Install the service valves on the compressor. Using a torque wrench and hexagon wrench*, tighten the bolts.

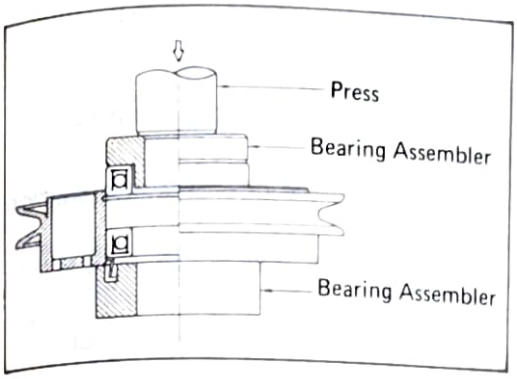
Torque: **2.5 – 2.7 kg-m (18.1 – 19.5 ft-lb)**

*SST 07110-61050 or Commercial wrench



14. CHECK SHAFT ROTATING TORQUE

Perform step 12, page 19-21.



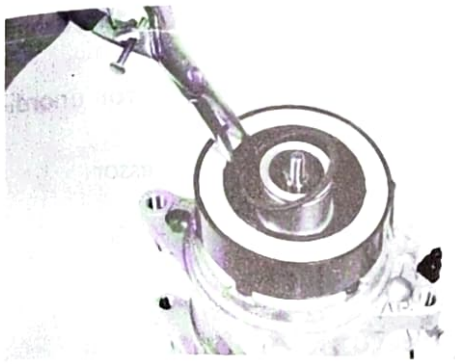
ASSEMBLY OF MAGNETIC CLUTCH
(See illustration on page 19-15)

1. INSTALL TWO BEARINGS IN ROTOR

(a) Using two bearing assemblers*, press a shield ring and two new bearings into the rotor boss until fully seated.

*SST 07110-77011 or Commercial assemblers

(b) Install the bearing snap ring into the rotor groove.



2. INSTALL STATOR

(a) Install the stator on the compressor.

(b) Using snap ring pliers*, install the snap ring.

*SST 07110-77011 or Commercial pliers

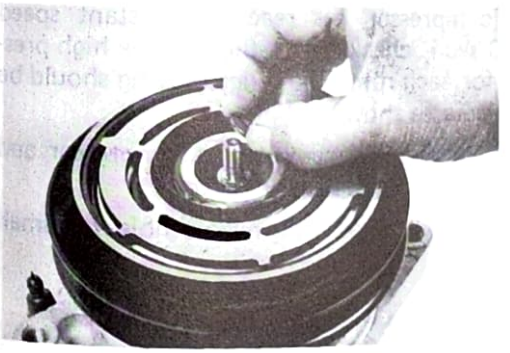
(c) Connect the stator lead wires to the compressor housing.

3. INSTALL ROTOR

(a) Install the rotor on the compressor shaft.

(b) Using snap ring pliers*, install the snap ring.

*SST 07110-77011 or Commercial pliers

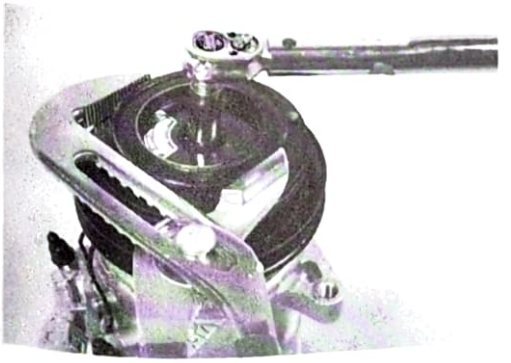


4. INSTALL PRESSURE PLATE

(a) Adjust the clearance between the pressure plate and rotor by placing the shims on the compressor shaft.

Standard clearance: 0.4 – 0.7 mm (0.016 – 0.028 in.)

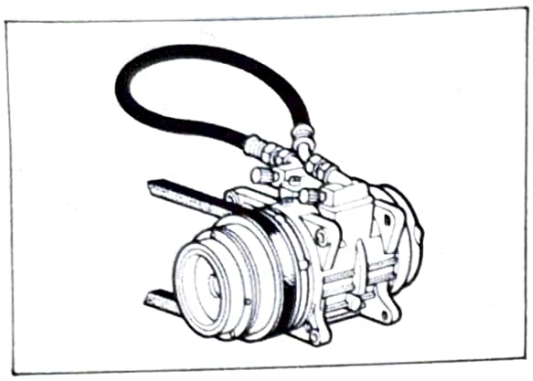
If the clearance is not within tolerance, add or reduce the number of shims to obtain the standard clearance.



(b) Using a torque wrench and holding bar*, install the shaft nut.

*SST 07110-77011 or Commercial bar or pliers

Torque: 1.50 – 1.75 kg-m (11 – 12 ft-lb)



PERFORMANCE TEST OF COMPRESSOR

1. PERFORM BREAK-IN OF COMPRESSOR

(a) Set up the compressor on a test bench or mount it on the engine.

(b) Connect a flexible hose to the discharge and suction service valves.

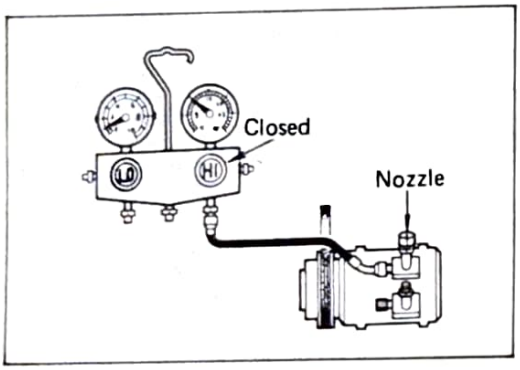
Torque: Discharge side 2.0 – 2.5 kg-m (15 – 18 ft-lb)
Suction side 3.0 – 3.5 kg-m (22 – 25 ft-lb)

(c) Engage the magnetic clutch and rotate the compressor for 15 minutes at less than 1,000 rpm.

CAUTION: Never rotate the compressor over 1,000 rpm to prevent overheating.

(d) While the compressor is rotating, check for unordinary sounds.

If necessary, disassemble and check the compressor.



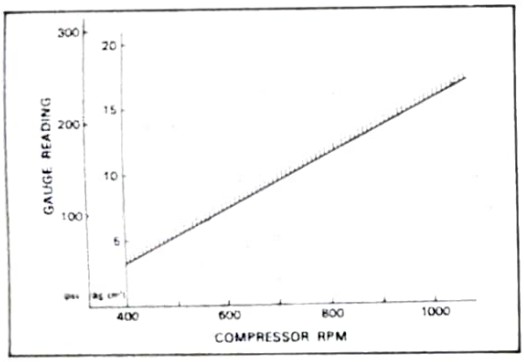
2. PERFORM VOLUMETRIC EFFICIENCY TEST

(a) Install nozzle* on the discharge service valve.

*SST 07115-71010

(b) Connect the charging hose for the high pressure gauge to the service port on the valve.

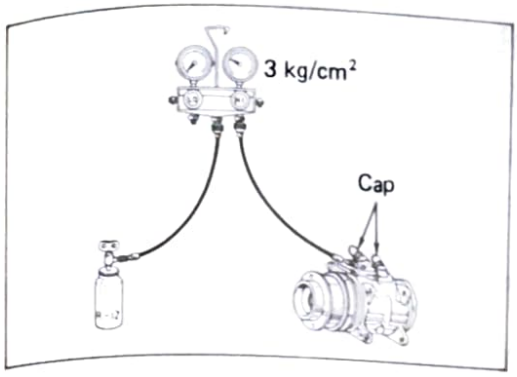
(c) Rotate the compressor in the range shown in the figure. Measure the compressor rpm with a tachometer.



(d) After the compressor has reached constant speed (approx. 10 sec.), check the reading on the high pressure gauge for each rpm. The gauge reading should be in the hatched area shown.

If the reading is below, disassemble the compressor and check for a faulty valve plate, reed or gasket.

If the reading is above, check the nozzle hole for small particles.



3. PERFORM GAS LEAKAGE TEST

(a) Put caps on both service valves.

(b) Charge the compressor with refrigerant through the charging valve until the pressure is 3 kg/cm² (43 psi).

(c) Using gas leak detector, check the compressor for leaks.

If leaks are found, check and replace the gasket, O-ring or shaft seal.

4. FILL COMPRESSOR WITH CLEAN COMPRESSOR OIL

(a) Remove the service valve and drain the compressor oil.

(b) Fill with new oil.

Compressor oil: DENSOIL 6, SUNISO No. 5GS or equivalent.

Compressor oil capacity: 155 – 185 cc (9.5 – 11.3 cu in.)

5. EVACUATE COMPRESSOR AND CHARGE WITH REFRIGERANT (See page 19-6)

Make sure caps are tight and free from moisture and contaminates.

NOTE: When storing a compressor for an extended period, charge the compressor with refrigerant or dry nitrogen gas to prevent corrosion.

INSTALLATION OF COMPRESSOR
(See illustration on page 19-14)

1. INSTALL COMPRESSOR WITH MOUNTING BOLTS

2. INSTALL DRIVE BELT (See page 4-43)

3. CONNECT TWO FLEXIBLE HOSES TO COMPRESSOR SERVICE VALVES

Torque: Discharge line 2.0 – 2.5 kg-m (15 – 18 ft-lb)
Suction line 3.0 – 3.5 kg-m (22 – 25 ft-lb)

4. CONNECT CLUTCH LEAD WIRE TO WIRING HARNESS

5. CONNECT NEGATIVE CABLE TO BATTERY

6. EVACUATE AND CHARGE AIR CONDITIONING SYSTEM (See page 19-6)

CONDENSER
(See illustration on page 19-12)

ON-VEHICLE INSPECTION

1. CHECK CONDENSER FINS FOR BLOCKAGE AND DAMAGE

   If the fins are clogged, wash them with water and dry with compressed air.

   CAUTION: Be careful not to damage the fins.

   If the fins are bent, straighten them with a screwdriver or pliers.

2. CHECK CONDENSER FITTINGS FOR LEAKAGE

   Repair as necessary.

REMOVAL OF CONDENSER

1. DISCHARGE REFRIGERANT VERY SLOWLY FROM SYSTEM (See page 19-5)

2. REMOVE FRONT GRILLE

3. DISCONNECT DISCHARGE FLEXIBLE HOSE FROM CONDENSER INLET FITTING

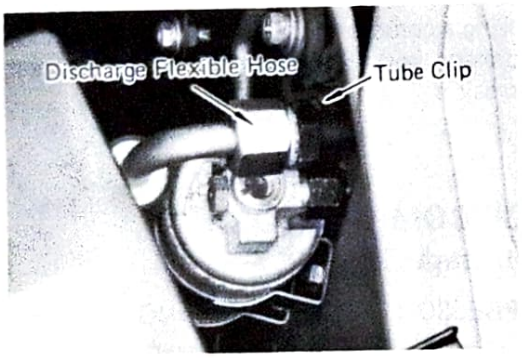
4. DISCONNECT LIQUID LINE TUBE FROM CONDENSER OUTLET FITTING

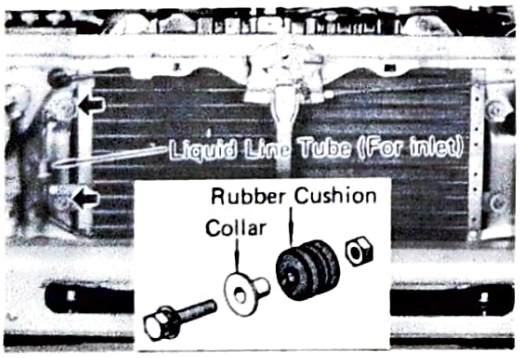
   Disconnect the liquid line tube and remove the tube clip.

   NOTE: Cap the open fittings immediately to keep moisture out of the system.

5. REMOVE CONDENSER

   Remove four bolts.





INSTALLATION OF CONDENSER

1. INSTALL CONDENSER

   Install four bolts making sure the rubber cushions fit on the mounting flanges correctly.

2. CONNECT LIQUID LINE TUBE AND DISCHARGE FLEXIBLE HOSE TO CONDENSER

   Torque: Liquid line tube
   1.2 – 1.5 kg-m (9 – 11 ft-lb)
   Discharge flexible hose
   2.0 – 2.5 kg-m (15 – 18 ft-lb)

   Install the tube clip.

3. INSTALL FRONT GRILLE

4. IF CONDENSER IS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

   Add 40 – 50 cc (1.4 – 1.7 oz)

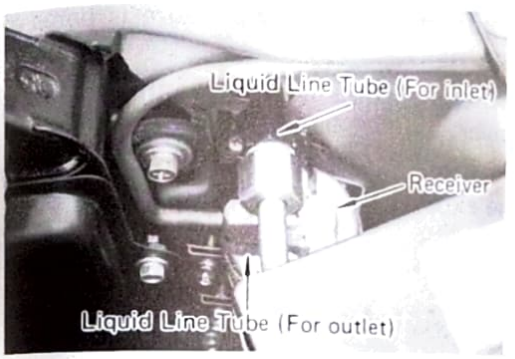
5. EVACUATE, CHARGE AND TEST AIR CONDITIONING SYSTEM (See page 19-6)

RECEIVER
(See illustration on page 19-12)

ON-VEHICLE INSPECTION

CHECK SIGHT GLASS, FUSIBLE PLUG AND FITTINGS FOR LEAKAGE

Use a gas leak tester. Repair as necessary.



REMOVAL OF RECEIVER

1. DISCHARGE REFRIGERANT VERY SLOWLY FROM SYSTEM (See page 19-5)
2. DISCONNECT TWO LIQUID LINE TUBES FROM RECEIVER

   NOTE: Cap the open fittings immediately to keep moisture out of the system.
3. REMOVE RECEIVER FROM RECEIVER HOLDER

INSTALLATION OF RECEIVER

1. INSTALL RECEIVER IN RECEIVER HOLDER

   NOTE: Do not remove the blind plugs until ready for connection.
2. CONNECT TWO LIQUID LINE TUBES TO RECEIVER

   Torque: 1.2 – 1.5 kg-m (9 – 11 ft-lb)
3. IF RECEIVER IS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

   Add 20 cc (0.7 oz)
4. EVACUATE, CHARGE AND TEST AIR CONDITIONING SYSTEM (See page 19-6)

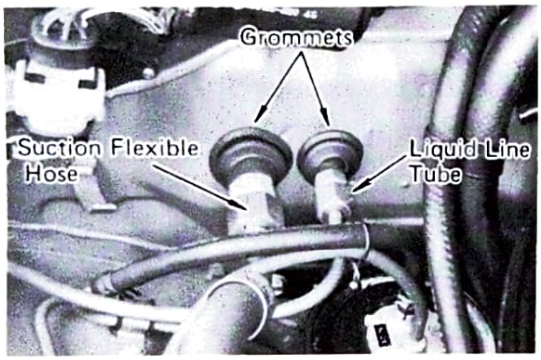
COOLING UNIT
(See illustration on page 19-12)

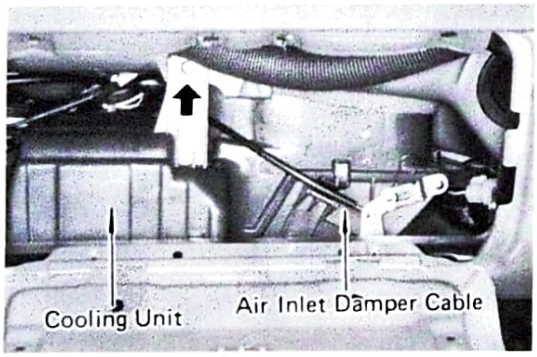
ON-VEHICLE INSPECTION OF EXPANSION VALVE

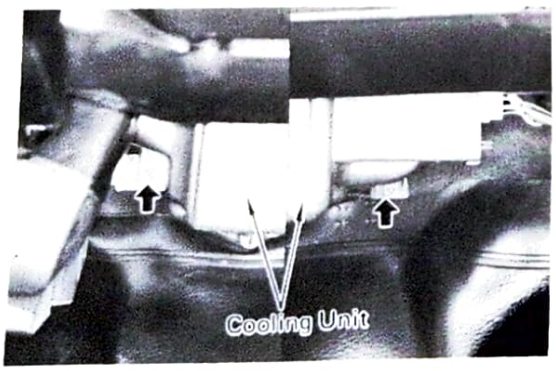
1. CONNECT MANIFOLD GAUGE TO COMPRESSOR
2. CHECK EXPANSION VALVE OPERATION
   (a) Run the engine at fast idle with the air conditioning ON.
   (b) Check that reading on the low pressure is between 0.5 – 5.0 kg/cm² (7 – 71 psi).

   If the reading is too low, check and replace the expansion valve and/or receiver.

   If the reading is too high, tighten the remote bulb holders and/or replace the expansion valve.







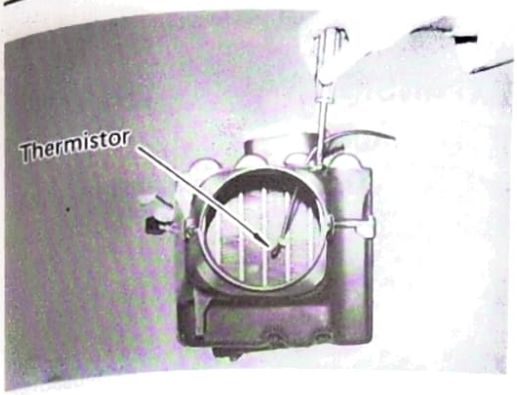
REMOVAL OF COOLING UNIT

1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. DISCHARGE REFRIGERANT VERY SLOWLY FROM SYSTEM (See page 19-5)
3. DISCONNECT SUCTION FLEXIBLE HOSE FROM COOLING UNIT OUTLET FITTING
4. DISCONNECT LIQUID LINE TUBE FROM COOLING UNIT INLET FITTING

   NOTE: Cap the open fittings immediately to keep moisture out of the system.
5. REMOVE GROMMETS FROM INLET AND OUTLET FITTINGS
6. REMOVE FOLLOWING COMPONENTS:
   (a) Glove box assembly
   (b) Side air duct
   (c) Air inlet damper cable
7. REMOVE COOLING UNIT

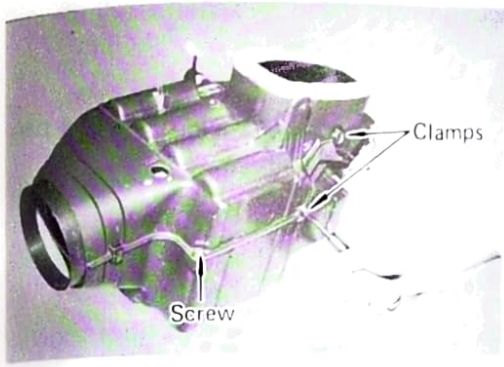
   Remove three bolts.
8. REMOVE IDLING STABILIZER AMPLIFIER

DISASSEMBLY OF COOLING UNIT



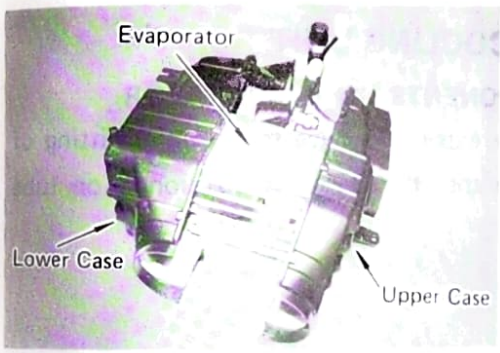
1. REMOVE THERMISTOR

Unscrew the tapping screws.

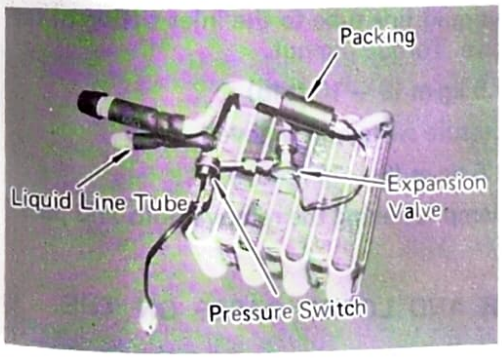


2. REMOVE UPPER AND LOWER CASES FROM EVAPORATOR

(a) Remove seven clamps and two screws.



(b) Remove upper and lower cases from the evaporator.



3. REMOVE COMPONENTS FROM EVAPORATOR

(a) Disconnect the liquid line tube from inlet fitting of the expansion valve.

(b) Remove the packing and the clamp fastening the remove bulb.

(c) Disconnect the expansion valve from the inlet fitting of the evaporator.

(d) Remove the pressure switch, if required.

Evaporator

INSPECTION OF EVAPORATOR

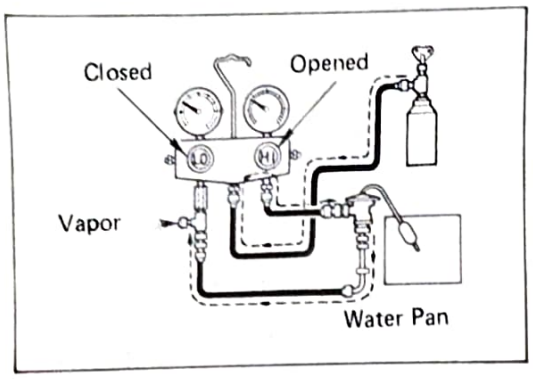
1. CHECK EVAPORATOR FINS FOR BLOCKAGE

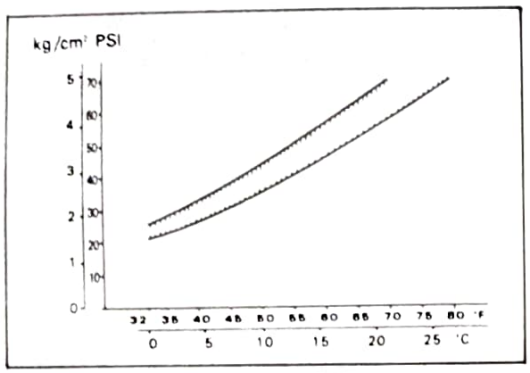
If the fins are clogged, clean them with compressed air.

CAUTION: **Never use water to clean the evaporator.**

2. CHECK FITTINGS FOR CRACKS OR SCRATCHES

Repair as necessary.





Expansion Valve

INSPECTION OF EXPANSION VALVE

1. CONNECT MANIFOLD GAUGE

Connect the manifold gauge set to the expansion valve and refrigerant container as shown.

2. CHECK EXPANSION VALVE

(a) Close both manifold gauge hand valves.

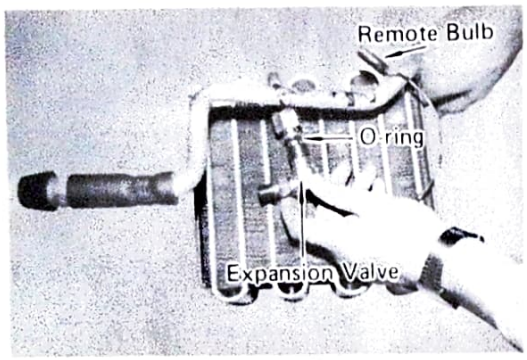
(b) Pierce the refrigerant container to release the pressure.

(c) Open the high pressure hand valve and adjust the high side pressure to approximately 5 kg/cm² (71 psi).

(d) Dip the remote bulb of the expansion valve in a pan filled with water. While varying the temperature of the water, read the low pressure gauge and at the same time measure the temperature of the water with a thermometer.

(e) Compare the two readings on the chart.

If the crossing point is not between the two lines shown, replace the expansion valve.

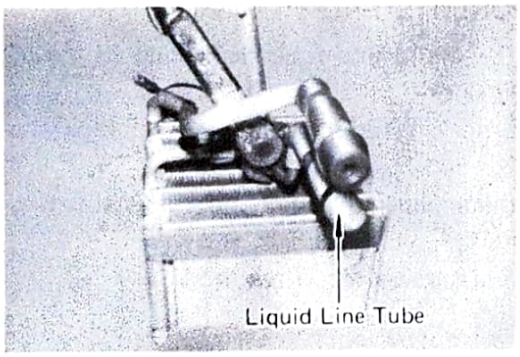


ASSEMBLY OF COOLING UNIT

1. INSTALL COMPONENTS ON EVAPORATOR

(a) Connect the expansion valve to the inlet fitting of

NOTE: Be sure that the O-ring is positioned on tube fitting.



(b) Connect the liquid line tube to the inlet fitting of the expansion valve. Torque the nut.

Torque: 1.2 – 1.5 kg-m (9 – 10 ft-lb)

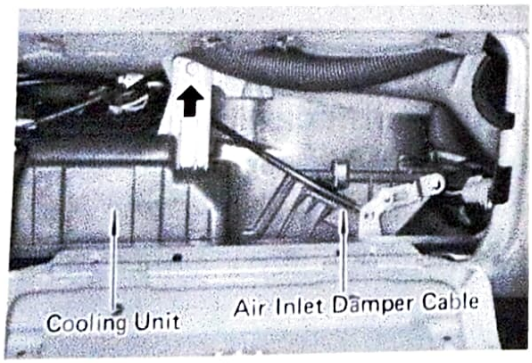
(c) Install the pressure switch, if removed.

Torque: 1.2 – 1.5 kg-m (9 – 10 ft-lb)

(d) Install the clamp fastening the remove bulb and packing.

2. INSTALL UPPER AND LOWER CASES ON THE EVAPORATOR

3. INSTALL COVER AND THERMISTOR



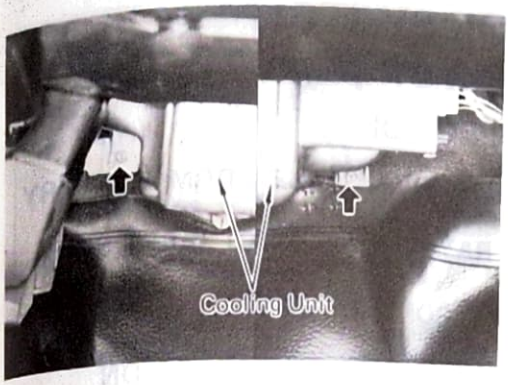
INSTALLATION OF COOLING UNIT

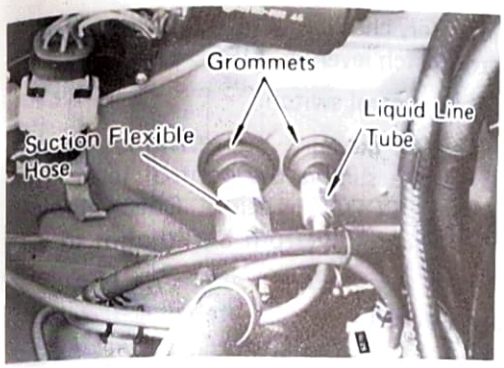
1. INSTALL IDLING STABILIZER AMPLIFIER

2. INSTALL COOLING UNIT

Install the cooling unit with three bolts.

CAUTION: Be careful not to pinch the wiring harness while installing the cooling unit.





3. INSTALL FOLLOWING COMPONENTS:
   (a) Air inlet damper cable
   (b) Side air duct
   (c) Glove box assembly

4. INSTALL GROMMETS ON INLET AND OUTLET FITTINGS

5. CONNECT LIQUID LINE TUBE TO COOLING UNIT INLET FITTING
   Torque: 1.2 – 1.5 kg-m (9 – 11 ft-lb)

6. CONNECT SUCTION FLEXIBLE HOSE TO COOLING UNIT OUTLET FITTING
   Torque: 3.0 – 3.5 kg-m (22 – 25 ft-lb)

7. IF EVAPORATOR IS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR
   Add 40 – 50 cc (1.4 – 1.7 oz)

8. CONNECT NEGATIVE CABLE TO BATTERY

9. EVACUATE, CHARGE AND TEST AIR CONDITIONING SYSTEM (See page 19-6)

REFRIGERANT LINES
(See illustration on page 19-12)

ON-VEHICLE INSPECTION

1. INSPECT HOSES AND TUBES FOR LEAKAGE
   Use a gas leak tester. Replace, if necessary.

2. CHECK THAT HOSE AND TUBE CLAMPS ARE NOT LOOSE
   Tighten or replace, as necessary.

REPLACEMENT OF REFRIGERANT LINES

1. DISCHARGE REFRIGERANT VERY SLOWLY FROM SYSTEM (See page 19-5)

2. REPLACE FAULTY TUBE OR HOSE
   NOTE: Cap the open fittings immediately to keep moisture out of the system.
   O-ring fittings are used at the tube and hose connections. Tighten the connections at the specified torque.

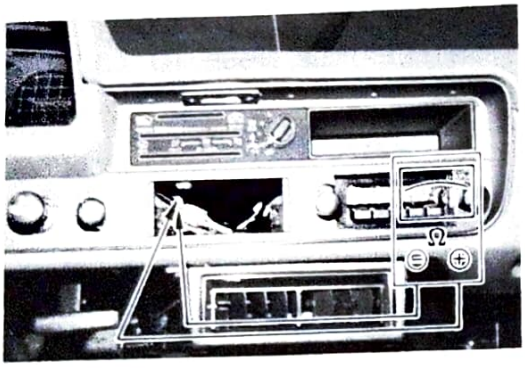
Tightening torque for O-ring fitting

Fitting size	Torque
3/8 in. tube for liquid line	1.2 – 1.5 kg-m (9 – 11 ft-lb)
1/2 in. tube for discharge line	2.0 – 2.5 kg-m (15 – 18 ft-lb)
5/8 in. tube for suction line	3.0 – 3.5 kg-m (22 – 25 ft-lb)

3. EVACUATE, CHARGE AND TEST AIR CONDITIONING SYSTEM (See page 19-6)

A/C CONTROL SWITCH
(See illustration on page 19-12)

ON-VEHICLE INSPECTION



1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. REMOVE ASH TRAY AND AIR DUCT (LEFT SIDE)
3. DISCONNECT A/C CONTROL SWITCH CONNECTOR
4. CHECK A/C CONTROL SWITCH OPERATION
   (a) Using an ohmmeter, check for infinity when placing the A/C control switch lever at "OFF" position.

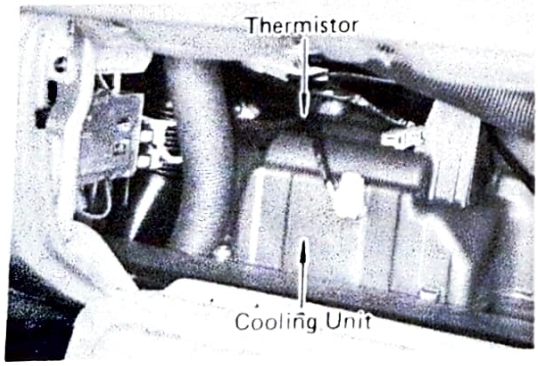
   If not, replace the A/C control switch.

   (b) Using an ohmmeter, measure the resistance of A/C control switch while sliding the control lever from "A/C" position to "COOL" position. Check that the reading decreases smoothly from 3 kilo-ohm to zero ohm.

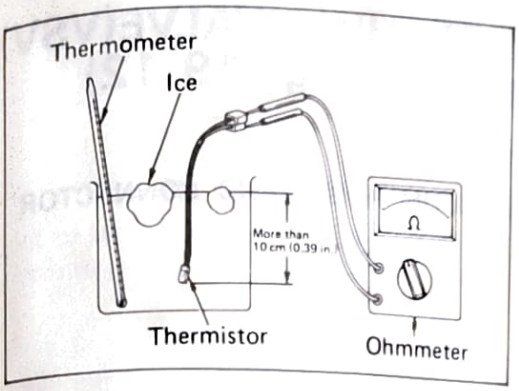
   If abnormal, replace the A/C control switch.
5. CONNECT A/C CONTROL SWITCH CONNECTOR
6. INSTALL ASH TRAY AND AIR DUCT (LEFT SIDE)
7. CONNECT NEGATIVE CABLE TO BATTERY

THERMISTOR
(See illustration on page 19-12)

REMOVAL OF THERMISTOR



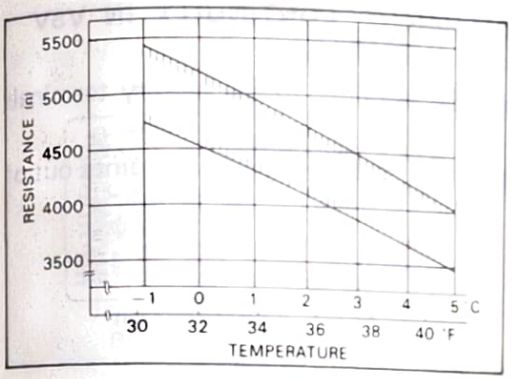
1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. REMOVE GLOVE BOX
3. REMOVE THERMISTOR
   (a) Disconnect connector.
   (b) Remove screw and thermistor from cooling unit.



INSPECTION OF THERMISTOR

CHECK TERMISTOR OPERATION

(a) Place the thermistor in cold water. While varying the temperature of the water, measure the resistance at the connector and at the same time, measure the temperature of the water with a thermometer.



(b) Compare the two readings on the chart.

If the crossing point is not between the two lines shown, replace the thermistor.

INSTALLATION OF THERMISTOR

1. INSTALL THERMISTOR
   (a) Install the thermistor with a screw.
   (b) Connect connector
2. INSTALL UNDERTRAY
3. CONNECT NEGATIVE CABLE TO BATTERY

BLOWER RESISTOR
(See illustration on page 19-12)

ON-VEHICLE INSPECTION

1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. REMOVE ASH TRAY
3. DISCONNECT BLOWER RESISTOR CONNECTOR
4. CHECK RESISTANCE OF BLOWER RESISTOR
   (a) Using an ohmmeter, measure the resistance between HI and M2.

   Resistance: 0.5 ohms

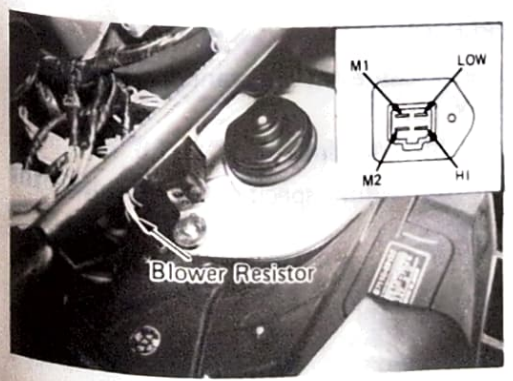
   (b) Using an ohmmeter, measure the resistance between M2 and M1.

   Resistance: 1.5 ohms

   (c) Using an ohmmeter, measure the resistance between M1 and LOW.

   Resistance: 3.2 ohms

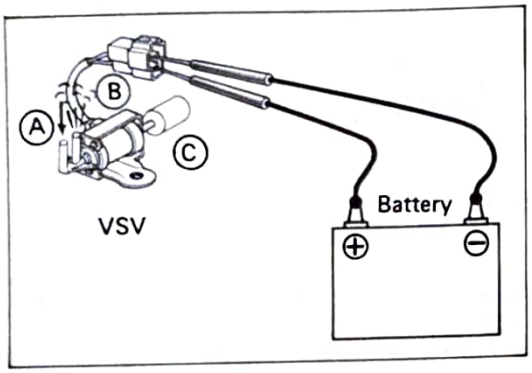
   If defective, replace the blower resistor.



VACUUM SWITCHING VALVE(VSV) (See illustration on page 19-12)

INSPECTION OF VSV

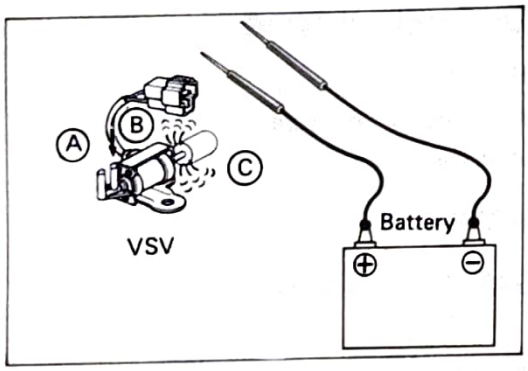
1. DISCONNECT VACUUM HOSES AND CONNECTOR FROM VSV



2. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as shown.

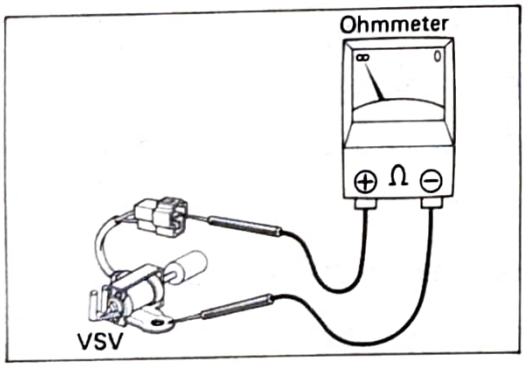
(b) Blow into pipe Ⓐ , and check that air comes out of pipe Ⓑ .



(c) Disconnect the battery.

(d) Blow into pipe Ⓑ and check that air comes out of filter Ⓒ – not out of pipe Ⓐ .

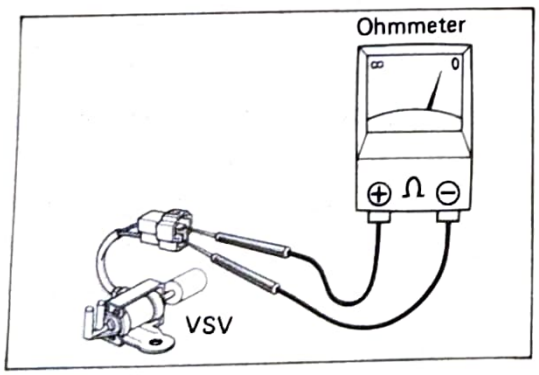
If a problem is found, replace the VSV.



3. CHECK FOR SHORT-CIRCUIT

Using an ohmmeter, check that there is no continuity between each terminal and the VSV body.

If a short circuit is found, repair or replace the VSV.



4. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between two terminals of the VSV.

Specified resistance: 38 – 43 ohms at 20° C (68° F)

If the resistance is not within specification, replace the VSV.

IDLING STABILIZER AMPLIFIER (See illustration on page 19-12)

INSPECTION OF IDLING STABILIZER AMPLIFIER

1. CHECK ENGINE SPEED DETECTING CIRCUIT

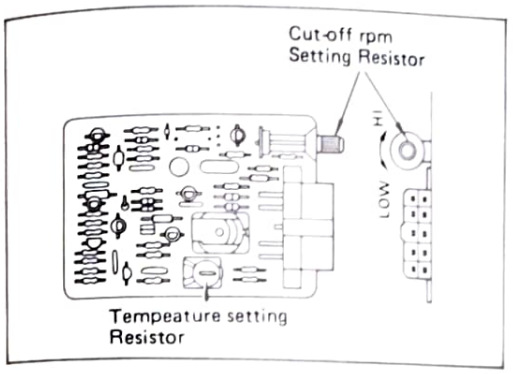
(a) Run the engine, and operate the air conditioner.

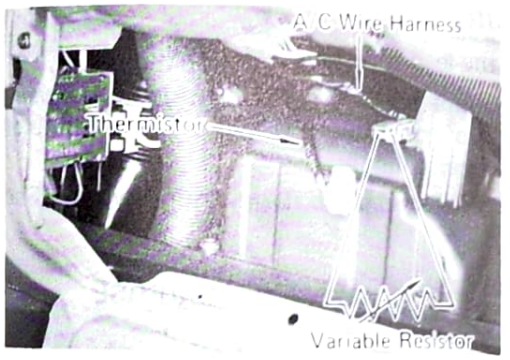
(b) Check that the magnetic clutch disengages at the specific engine revolution.

Cut-off rpm: 700 – 800 rpm

If the cut-off rpm is too high, turn the rpm knob counterclockwise to adjust the cut-off point.

If the cut-off rpm is too low, turn the rpm knob clockwise to adjust the cut-off point.





2. CHECK TEMPERATURE DETECTING CIRCUIT

(a) Remove the glove box.

(b) Disconnect the thermistor connector and connect variable resistor.

(c) Run the engine and operate the air conditioner to get maximum cooling.

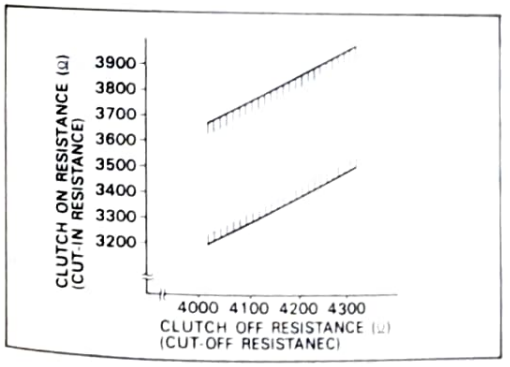
- Air intake control: RECIRC
- Air flow control: VENT
- Temperature control: COOL
- Blower control: HI

(d) Measure the resistance of the variable resistor when the magnetic clutch cuts-off and cuts-in.

If the resistance is not between the two lines shown, adjust the amplifier.

If the cut-off or cut-in resistance is too high, turn the TEMP adjusting screw clockwise.

If the resistance is too low or the evaporator is frosted, turn the TEMP adjusting screw counterclockwise until the magnetic clutch engages at the standard resistance.



PRESSURE SWITCH (See illustration on page 19-12)

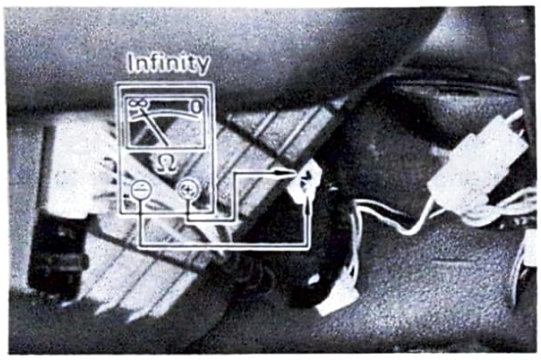
INSPECTION OF PRESSURE SWITCH

1. CHECK REFRIGERANT PRESSURE

   (a) Connect the hoses of the manifold gauge set to the compressor service valves and observe the gauge reading.

   (b) The gauge reading must be more than 2.11 kg/cm² (30 psi) when the ambient temperature is higher than 0°C (32°F).

   If the pressure is less than 2.11 kg/cm² (30 psi), charge the refrigerant. (See page 19-6)



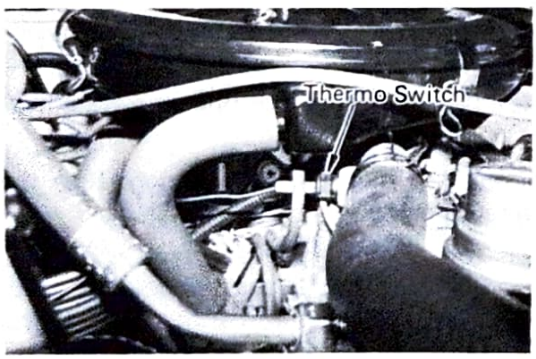
2. CHECK PRESSURE SWITCH

   (a) Disconnect the lead wires of pressure switch.

   (b) Using an ohmmeter, check the continuity between two terminals of the pressure switch. The ohmmeter must indicate zero ohm.

   If there is no continuity, replace the pressure switch. (See page 19-37)

3. REINSTALL REMOVED PARTS IN REVERSE ORDER



THERMO SWITCH (For 4-wheels drive model only)

INSPECTION OF THERMO SWITCH

1. CHECK THERMO SWITCH

   (a) Disconnect the lead wire of thermo switch.

   (b) Using an ohmmeter, check the continuity between the terminal of thermo switch and ground.
   The ohmmeter must indicate zero ohm when engine coolant temperature is less than 101°C (213°F).

   If there is no continuity, replace the thermo switch.

2. REINSTALL REMOVED PARTS IN REVERSE ORDER

SERVICE SPECIFICATIONS

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STARTING SYSTEM	A-6
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PROPELLER SHAFT	A-15
FRONT AXLE AND SUSPENSION	A-16
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CLUTCH AND MANUAL TRANSMISSION	A-26
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LUBRICANTS	A-37

MAINTENANCE AND TUNE-UP

Drive belt tension			
w/Borroughs drive belt tension gauge No. BT-33-73F			
	New belt	125 ± 25 lb	
	Used belt	80 ± 20 lb	
Battery specific gravity When fully charged at 20°C (68°F)		1.25 – 1.27	
Coolant capacity w/ heater or air conditioner		8.4 liters	8.9 US qts 7.4 Imp. qts
Engine oil capacity	Dry fill	4.8 liters	5.1 US qts 4.2 Imp. qts
	Drain and refill		
	w/ Oil filter change	4.6 liters	4.9 US qts 4.0 Imp. qts
	w/o Oil filter change	3.8 liters	4.0 US qts 3.3 Imp. qts
Spark plug			
Type	ND	W16EXR-U	
	NGK	BPR5EA-L, BPR5EY	
Gap		0.8 mm	0.031 in.
Ignition timing		8° BTDC @ Max. 950 rpm (w/ vacuum advancer OFF)	
Firing order		1 – 3 – 4 – 2	
Valve clearance (hot)	Intake	0.20 mm	0.008 in.
	Exhaust	0.30 mm	0.012 in.
Idle speed	M/T	700 rpm	
	A/T	750 rpm	
Idle mixture speed		See page A-3	
Intake manifold vacuum	at Idle speed	More than 400 mmHg (15.75 in.Hg)	
Fast idle speed		2,600 rpm (EGR system OFF, vacuum advancer OFF and choke opener system OFF)	
Compression pressure	STD	More than 12.0 kg/cm^2 (171 psi)	
	Limit	10.0 kg/cm^2 (142 psi)	
Differential of pressure between each cylinder		Less than 1.0 kg/cm^2 (14 psi)	

ENGINE
Specifications

Carburetor	Part No.		21100-35010, 35050, 35060, 35080, 35090 35100, 35110, 35120
	Float level Raised position (float top to air horn)		10.5 mm 0.413 in.
	Lowered position (float bottom to air horn)		48 mm 1.89 in.
	Float lip clearance (at float lowered)		1 mm 0.04 in.
	Throttle valve closed angle	Primary	9° from horizontal plane
		Secondary	20° from horizontal plane
	Throttle valve full open angle	Primary	90° from horizontal plane
		Secondary	90° from horizontal plane
	Secondary touch angle		50° from horizontal plane
	Fast idle angle		24° from horizontal plane
	Unloader angle	Canada RN 4x4	50° from horizontal plane (21100 – 35120)
		Others	45° from horizontal plane
	Idle mixture adjusting screw presetting		Screw out 2-1/2 turns
	Idle mixture speed		
	M/T		740 rpm
	A/T		790 rpm
	Accelerating pump stroke		4.1 mm 0.161 in.

Distributor	Air gap	0.2 – 0.4 mm 0.008 – 0.016 in.				
	Distributor advance angle (Part No.)	Governor		Vacuum		
		Dis. rpm	Advance angle	mmHg	in.Hg	Advance angle
	(19100-35040)	550	Advance begins	Main		
		1,100	3.6°	60	2.36	Advance begins
		2,500	9.5°	200	7.87	9°
				Sub		
				200	7.87	Advance begins
				300	11.81	3.5°
High tension wire	Resistance Limit	Less than 25 kΩ				
Ignition coil	Primary coil resistance	0.4 – 0.5 Ω				
	Secondary coil resistance	8.5 – 11.5 kΩ				
	Insulation resistance w/ 500 V megohm meter	More than 10 MΩ				

Specifications(Cont'd)

Spark plug	Type			ND	W16EXR-U
				NGK	BPR5EA-L, BPR5EY
	Gap				0.8 mm 0.031 in.
Cylinder head	Head surface warpage		Limit		0.15 mm 0.0059 in.
	Maximum reface		Limit		0.20 mm 0.0079 in.
	Valve seat	Refacing angle		IN	30°, 45°, 60°
				EX	30°, 45°, 65°
		Contacting angle			45°
		Contacting width			1.2 – 1.6 mm 0.047 – 0.063 in.
Valve guide bushing	Inner diameter			Intake	8.01 – 8.03 mm 0.3154 – 0.3161 in.
				Exhaust	8.01 – 8.03 mm 0.3154 – 0.3161 in.
	Outer diameter			STD	13.040 – 13.051 mm 0.5134 – 0.5138 in.
				O/S type 0.05	13.090 – 13.101 mm 0.5154 – 0.5158 in.
	Protrusion from cylinder head				19 mm 0.75 in.
	Replacing temperature (cylinder head side)				Normal temperature
Valve	Valve overall length		STD	Intake	113.5 mm 4.468 in.
				Exhaust	112.4 mm 4.425 in.
	Valve face angle			IN & EX	44.5°
	Stem diameter		STD	Intake	7.970 – 7.985 mm 0.3188 – 0.3145 in.
				Exhaust	7.965 – 7.980 mm 0.3136 – 0.3142 in.
	Stem end refacing		Limit	IN & EX	0.5 mm 0.020 in.
	Stem oil clearance		STD	Intake	0.02 – 0.06 mm 0.0008 – 0.0024 in.
				Exhaust	0.03 – 0.07 mm 0.0012 – 0.0026 in.
			Limit	Intake	0.08 mm 0.0031 in.
				Exhaust	0.10 mm 0.0039 in.
	Valve head edge thickness		Limit		0.6 mm 0.024 in.
Valve spring	Free length				45.8 mm 1.803 in.
	Installed length				40.5 mm 1.594 in.
	Installed load		STD		25.0 kg 55.1 lb
			Limit		22.5 kg 49.6 lb
	Squareness		Limit		1.6 mm 0.063 in.
Rocker arm and shaft	Rocker shaft diameter				15.97 – 15.99 mm 0.6287 – 0.6295 in.
	Shaft to arm oil clearance		STD		0.01 – 0.05 mm 0.0004 – 0.0020 in.
			Limit		0.08 mm 0.0031 in.
Intake and exhaust manifold	Manifold surface warpage		Limit	Intake	0.20 mm 0.0079 in.
				Exhaust	0.70 mm 0.0276 in.
Chain and sprocket	Crankshaft sprocket wear		Limit		59.4 mm 2.339 in.
	Camshaft sprocket wear		Limit		113.8 mm 4.480 in.
Tensioner and damper	Tensioner head thickness		Limit		11.0 mm 0.433 in.
	Damper No. 1 thickness		Limit		5.0 mm 0.197 in.
	Damper No. 2 thickness		Limit		4.5 mm 0.177 in.
Camshaft	Thrust clearance		STD		0.08 – 0.18 mm 0.0031 – 0.0071 in.
			Limit		0.25 mm 0.0098 in.
	Journal oil clearance		STD		0.01 – 0.05 mm 0.0004 – 0.0020 in.
			Limit		0.1 mm 0.004 in.
	Journal diameter		STD		32.98 – 33.00 mm 1.2984 – 1.2992 in.

Specifications(Cont'd)

Camshaft (cont'd)	Circle runout	Limit	0.2 mm	0.008 in.
	Cam height	Intake	42.63 – 42.72 mm	1.6783 – 1.6819 in.
		Exhaust	42.69 – 42.78 mm	1.6807 – 1.6842 in.
Cylinder block	Warpage	Limit	0.05 mm	0.0020 in.
	Cylinder bore	STD	92.00 – 92.03 mm	3.6220 – 3.6232 in.
	Cylinder bore wear	Limit	0.2 mm	0.008 in.
	Difference of bore limit between cylinder		Less than 0.03 mm (0.0012 in.)	
	Taper and out-of-round	Limit	0.02 mm	0.0008 in.
Piston and piston ring	Piston diameter	STD	91.938 – 91.968 mm	3.6196 – 3.6208 in.
		O/S type 0.50	92.438 – 92.468 mm	3.6393 – 3.6405 in.
		O/S type 1.00	92.938 – 92.968 mm	3.6590 – 3.6602 in.
	Piston to cylinder clearance		0.052 – 0.072 mm	0.0020 – 0.0028 in.
	Piston ring end gap (compression)	No. 1	0.24 – 0.36 mm	0.0094 – 0.0142 in.
		No. 2	0.18 – 0.39 mm	0.0071 – 0.0154 in.
	Ring to ring groove clearance	Limit No. 1, No. 2	0.2 mm	0.008 in.
	Piston pin installing temperature		80°C	176°F
Connecting rod and bearing	Thrust clearance	STD	0.16 – 0.26 mm	0.0063 – 0.0102 in.
		Limit	0.30 mm	0.0118 in.
	Bearing oil clearance	STD	0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit	0.8 mm	0.031 in.
	Pin to bushing oil clearance	STD	0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit	0.015 mm	0.0006 in.
	Rod bend	Limit	0.05 mm	0.0020 in.
	Rod twist	Limit	0.15 mm	0.0059 in.
Crankshaft	Thrust clearance	STD	0.02 – 0.22 mm	0.0008 – 0.0087 in.
		Limit	0.30 mm	0.0118 in.
	Thrust washer thickness	STD	2.00 mm	0.0787 in.
		O/S type 0.125	2.06 mm	0.0811 in.
		O/S type 0.25	2.13 mm	0.0839 in.
	Main journal oil clearance	STD	0.016 – 0.05 mm	0.0006 – 0.0020 in.
		Limit	0.08 mm	0.0031 in.
	Main journal diameter	STD	59.98 – 60.00 mm	2.3614 – 2.3622 in.
		Bearing U/S type 0.25	59.70 – 59.71 mm	2.3504 – 2.3508 in.
		Bearing U/S type	0.25	
	Crank pin oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
		Limit	0.1 mm	0.004 in.
	Crank pin diameter	STD	52.99 – 53.00 mm	2.0862 – 2.0866 in.
		Bearing U/S type 0.25	52.70 – 52.71 mm	2.0748 – 2.0752 in.
		Bearing U/S type	0.25	
	Circle runout	Limit	0.1 mm	0.004 in.
	Main journal taper and out-of-round	Limit	0.01 mm	0.0004 in.
	Crank pin journal taper and out-of-round	Limit	0.01 mm	0.0004 in.
Flywheel	Runout	Limit	0.2 mm	0.008 in.

Specifications(Cont'd)

Oil pump	Body clearance	STD	0.09 – 0.15 mm	0.0035 – 0.0059 in.
		Limit	0.2 mm	0.008 in.
	Tip clearance			
	Driven gear to crescent	STD	0.15 – 0.21 mm	0.0059 – 0.0083 in.
		Limit	0.3 mm	0.012 in.
	Drive gear to crescent	STD	0.22 – 0.25 mm	0.0087 – 0.0098 in.
		Limit	0.3 mm	0.012 in.
	Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
		Limit	0.15 mm	0.0059 in.
	Relief valve operating pressure		4.5 kg/cm^2	64 psi

Tightening Torque

Tightening part		kg-m	ft-lb
Cylinder head x Cylinder block		7.2 – 8.8	53 – 63
Manifold x Cylinder head	Intake	1.8 – 2.6	13 – 19
	Exhaust	4.0 – 5.0	29 – 36
Crankshaft bearing cap x Cylinder block		9.5 – 11.5	69 – 83
Connecting rod cap x Connecting rod		5.4 – 6.6	40 – 47
Crankshaft pulley x Crankshaft		14.0 – 18.0	102 – 130
Flywheel x Crankshaft		10.0 – 12.0	73 – 86
Camshaft bearing cap x Cylinder head		1.7 – 2.3	13 – 16
Camshaft timing sprocket x Camshaft		7.0 – 9.0	51 – 65
Oil pan x Cylinder block		0.4 – 0.8	35 – 69 in.-lb
Thermo switch x Intake manifold		2.5 – 3.5	19 – 25

COOLING SYSTEM

Radiator	Relief valve opening pressure	STD	0.75 – 1.05 kg/cm^2	10.7 – 14.9 psi
		Limit	0.6 kg/cm^2	8.5 psi
Thermostat	Valve opening temperature			
	Starts to open at		88°C	190°F
	Fully opens at		100°C	212°F
	Valve opening travel		8 mm or more	0.31 in. or more

STARTING SYSTEM

Reduction type starter	Rated voltage and output power			12V, 1.0 kw	12V, 1.4 kw
	No-load characteristic		Ampere	Less than 90A	Less than 90A
			rpm	More than 3,000 rpm at 11.5V	More than 3,500 rpm at 11.5V
	Brush	Length	STD	13.5 mm 0.531 in.	14.5 mm 0.571 in.
			Limit	10 mm 0.39 in.	←
	Commutator	Outer diameter	STD	30 mm 1.18 in.	←
			Limit	29 mm 1.14 in.	←
		Mica depth	STD	0.45 – 0.75 mm 0.0177 – 0.0295 in.	←
			Limit	0.2 mm 0.008 in.	←

STARTING SYSTEM (Cont'd)

Reduction type starter (cont'd)	Runout	Limit	0.2 mm 0.008 in.	←
	Spring installed load	STD	1,445 – 1,955 g 3.2 – 4.3 lb	1,785 – 2,415 g 3.9 – 5.3 lb
		Limit	1,200 g 2.6 lb	←

CHARGING SYSTEM

Alternator			TIRRILL regulator type	IC regulator type
	Rated output		40 A	40A, 55A, 60A
	Brush exposed length	STD	12.5 mm 0.492 in.	←
		Limit	5.5 mm 0.217 in.	←
	Rotor coil resistance		3.9 – 4.1 Ω	2.8 – 3.0 Ω
Alternator regulator	Regulating voltage	TIRRILL regulator	13.8 – 14.8 V	
		IC regulator	14.0 – 14.7 V	

CLUTCH AND MANUAL TRANSMISSION (RN 4×2)

Specifications

Clutch	Pedal height (from floor panel)		152 – 162 mm	5.98 – 6.38 in.
	Pedal freeplay		5 – 15 mm	0.20 – 0.59 in.
	Release fork end play		None adjustable type	
	Disc rivet head depth	Limit	0.3 mm	0.012 in.
	Disc runout	Limit	0.8 mm	0.031 in.
	Diaphragm spring out of alignment	Limit	0.5 mm	0.020 in.
	Diaphragm spring finger wear	Limit	0.6 mm	0.024 in.
Manual transmission (W50)	Output shaft			
	2nd and 3rd gear journal diameter	Limit	40.8 mm	1.606 in.
	Flange thickness	Limit	4.80 mm	0.1890 in.
	Runout	Limit	0.05 mm	0.0020 in.
	1st gear bushing flange thickness	Limit	4.55 mm	0.1791 in.
	5th gear bushing flange thickness	Limit	3.85 mm	0.1516 in.
	Gear thrust clearance			
	1st, 2nd, 3rd & Reverse idle	STD	0.15 – 0.25 mm	0.0059 – 0.0098 in.
		Limit	0.3 mm	0.012 in.
	5th	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.3 mm	0.012 in.
	Gear oil clearance 1st	STD	0.009 – 0.053 mm	0.0004 – 0.0021 in.
		Limit	0.06 mm	0.0024 in.
	2nd & 3rd	STD	0.060 – 0.103 mm	0.0024 – 0.0041 in.
		Limit	0.15 mm	0.0059 in.
	5th	STD	0.009 – 0.051 mm	0.0004 – 0.0020 in.
		Limit	0.06 mm	0.0024 in.
	Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	Synchronizer ring to gear clearance	Limit	0.8 mm	0.031 in.
	Input shaft snap ring thickness			
	Part No.	Mark		
	90520-30214	0	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	90520-30215	1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	90520-30216	2	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	90520-30217	3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	90520-30218	4	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	90520-30219	5	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	Output shaft snap ring thickness			
	Front Part No.	Mark		
	90520-30238	None	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	90520-30214	0	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	90520-30215	1	2.10 – 2.15 mm	0.0827 – 0.0846 in.

Specifications (Cont'd)

Manual transmission (W50) (cont'd)		Part No.	Mark		
		90520-30216	2	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		90520-30217	3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		90520-30218	4	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	Rear	Part No.	Mark		
		90520-25277	1	1.89 – 1.94 mm	0.0744 – 0.0764 in.
		90520-25278	2	1.95 – 2.00 mm	0.0768 – 0.0787 in.
		90520-25279	3	2.01 – 2.06 mm	0.0791 – 0.0811 in.
		90520-25280	4	2.07 – 2.12 mm	0.0815 – 0.0835 in.
		90520-25281	5	2.13 – 2.18 mm	0.0839 – 0.0858 in.
		90520-25282	6	2.19 – 2.24 mm	0.0862 – 0.0882 in.
		90520-25283	7	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		90520-25284	8	2.31 – 2.36 mm	0.0909 – 0.0929 in.
		90520-25285	9	2.37 – 2.42 mm	0.0933 – 0.0953 in.
		90520-25270	10	2.43 – 2.48 mm	0.0957 – 0.0976 in.
		90520-25271	11	2.49 – 2.54 mm	0.0980 – 0.1000 in.
		90520-25272	12	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		90520-25273	13	2.61 – 2.66 mm	0.1028 – 0.1047 in.
	Countershaft snap ring thickness (Rear bearing)				
		Part No.	Mark		
		90520-18264	1	2.00 – 2.05 mm	0.0787 – 0.0807 in.
		90520-18265	2	1.80 – 1.85 mm	0.0709 – 0.0728 in.
		90520-18266	3	1.60 – 1.65 mm	0.0630 – 0.0650 in.
		90520-18275	4	1.40 – 1.45 mm	0.0551 – 0.0571 in.
	Counter gear front bearing spacer thickness				
	Clearance between bearing and transmission case	Part No.	Mark		
	2.87 – 2.99 mm (0.1130 – 0.1177 in.)	90560-38331	•	1.95 – 2.05 mm	0.0768 – 0.0807 in.
	3.00 – 3.09 mm (0.1181 – 0.1217 in.)	90560-38332	••	2.10 – 2.20 mm	0.0827 – 0.0866 in.
	3.10 – 3.19 mm (0.1220 – 0.1256 in.)	90560-38333	•••	2.25 – 2.35 mm	0.0886 – 0.0925 in.
	3.20 – 3.29 mm (0.1260 – 0.1295 in.)	90560-38334	••••	2.40 – 2.50 mm	0.0945 – 0.0984 in.
	Gear backlash		Limit	0.2 mm	0.008 in.
	Extension housing bushing installing temperature			80 – 100°C	176 – 212°F

Specifications (Cont'd)

Manual transmission (L48)	Gear thrust clearance 1st, 2nd & 3rd			
		STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.25 mm	0.0098 in.
	3rd gear to output shaft oil clearance	STD	0.0090 – 0.0325 mm	0.0004 – 0.0013 in.
		Limit	0.0325 mm	0.0013 in.
	2nd gear to output shaft oil clearance	STD	0.0090 – 0.0325 mm	0.0004 – 0.0013 in.
		Limit	0.0325 mm	0.0013 in.
	1st gear to roller and bushing oil clearance			
		STD	0.009 – 0.032 mm	0.0004 – 0.0013 in.
		Limit	0.032 mm	0.0013 in.
	Reverse idler to shaft oil clearance	STD	0.040 – 0.082 mm	0.0016 – 0.0032 in.
		Limit	0.082 mm	0.0032 in.
	Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	Synchronizer ring to gear clearance	Limit	0.8 mm	0.031 in.
	Output shaft runout	Limit	0.05 mm	0.0020 in.
	Input shaft snap ring thrust clearance		0 – 0.10 mm	0 – 0.0039 in.
	Snap ring thickness / Part No. / Mark			
	90520-30214	0	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	90520-30215	1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	90520-30216	2	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	90520-30217	3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	90520-30218	4	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	90520-30219	5	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	Output shaft snap ring thrust clearance (for Rear)		0 – 0.10 mm	0 – 0.0039 in.
	Snap ring thickness / Part No. / Mark			
	90520-25005	A	2.67 – 2.72 mm	0.1051 – 0.1071 in.
	90520-25006	B	2.73 – 2.78 mm	0.1075 – 0.1094 in.
	90520-25009	C	2.79 – 2.84 mm	0.1098 – 0.1118 in.
	90520-25010	D	2.85 – 2.90 mm	0.1122 – 0.1141 in.
	90520-25011	E	2.91 – 2.96 mm	0.1146 – 0.1165 in.
	90520-25012	F	2.97 – 3.02 mm	0.1169 – 0.1189 in.
	90520-25013	G	3.03 – 3.08 mm	0.1193 – 0.1213 in.
	90520-25014	H	3.09 – 3.14 mm	0.1217 – 0.1236 in.
	90520-25015	J	3.15 – 3.20 mm	0.1240 – 0.1260 in.
	90520-25016	K	3.21 – 3.26 mm	0.1264 – 0.1283 in.
	90520-25017	L	3.27 – 3.32 mm	0.1287 – 0.1307 in.

Specifications (Cont'd)

Manual transmission (L48) (cont'd)	Output shaft snap ring thrust clearance (for Front)		0 – 0.10 mm	0 – 0.0039 in.
	Snap ring thickness	Part No. / Mark		
		90520-28245 D	1.80 – 1.85 mm	0.0709 – 0.0728 in.
		90520-28010 D-1	1.85 – 1.90 mm	0.0728 – 0.0748 in.
		90520-28346 E	1.90 – 1.95 mm	0.0748 – 0.0768 in.
		90520-28011 E-1	1.95 – 2.00 mm	0.0768 – 0.0787 in.
		90520-28248 F	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	Counter gear front bearing snap ring thrust clearance		0 – 0.10 mm	0 – 0.0039 in.
	Snap ring thickness	Part No. / Mark		
		90520-23115 1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		90520-23089 2	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		90520-23143 3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		90520-23090 4	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		90520-23144 5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		90520-23145 6	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	Gear shift arm shoe end thickness	Limit	7.5 mm	0.295 in.
	Gear shift arm shoe to groove clearance	Limit	0.6 mm	0.024 in.
	Bimetal formed bushing to propeller shaft oil clearance		0.025 – 0.075 mm	0.0010 – 0.0030 in.
	Bimetal formed bushing inside diameter		38.020 – 38.045 mm	1.4968 – 1.4978 in.
	Extension housing bushing installing temperature		80 – 100°C	176 – 212°F

Tightening Torque

Clutch	Tightening part		kg-m	ft-lb
	Clutch cover x Flywheel		1.5 – 2.2	11 – 15
	Clutch housing x Engine		5.0 – 8.0	37 – 57
	Master cylinder reservoir set bolt		2.0 – 3.0	15 – 21
	Release fork support x Clutch housing		3.0 – 4.5	22 – 32
	Strap x Clutch pressure plate		2.0 – 3.0	15 – 21
Manual transmission (W50, L48)	Clutch housing x Transmission case	W50	5.0 – 8.0	37 – 57
	Extension housing x Transmission case	W50	4.0 – 4.5	29 – 32
		L48	4.0 – 5.5	29 – 39
	Front bearing retainer x Transmission case	W50	1.0 – 1.4	8 – 10
		L48	2.0 – 2.8	15 – 20
	Center bearing retainer x Intermediate plate	W50	1.0 – 1.6	8 – 11
	Output shaft rear bearing retainer x Transmission case	L48	1.5 – 2.2	11 – 15
	Counter gear rear lock nut	L48	11.0 – 14.0	80 – 101
	Case cover x Transmission case	L48	1.5 – 2.2	11 – 15
	Select outer lever lock bolt	L48	1.9 – 3.1	14 – 22

AUTOMATIC TRANSMISSION (A43D) (RN 4×2)

Specifications

Governor pressure		
Output shaft rpm (Vehicle speed reference)		
1,000 (approx. 21 mph 33 km/h)	0.9 – 1.5 kg/cm²	13 – 21 psi
1,800 (approx. 36 mph 58 km/h)	1.6 – 2.2 kg/cm²	23 – 31 psi
3,500 (approx. 70 mph 113 km/h)	4.1 – 5.3 kg/cm²	58 – 75 psi
Line pressure (wheel locked)		
Engine 1,000 rpm D range	4.0 – 4.5 kg/cm²	57 – 64 psi
Engine 1,000 rpm R rnge	5.8 – 6.8 kg/cm²	82 – 97 psi
At stall D range	9.5 – 12.0 kg/cm²	135 – 171 psi
At stall (Throttle valve fully opened) R range	14.0 – 17.0 kg/cm²	199 – 242 psi
Engine stall revolution	2,000 ± 150 rpm	
Time lag N range → D range	Less than 1.2 seconds	
Time lag N range → R range	Less than 1.5 seconds	
Throttle cable adjustment (Throttle valve fully opened)		
Between boot end face and inner cable stopper	0 – 1 mm	0 – 0.04 in.
Output shaft thrust play	0.3 – 0.9 mm	0.012 – 0.035 in.
Oil pump input shaft thrust play	0.3 – 0.9 mm	0.012 – 0.035 in.
Drive plate runout Limit	Less than 0.20 mm (0.0079 in.)	
Torque converter runout Limit	Less than 0.30 mm (0.0118 in.)	

Shift point schedule km/h (mph)

Tire size	Differential gear ratio	D range (throttle valve fully open) 1→2	2→3	3→4	4→3	3→2	2→1	L range 2→1
E78–14 7.00–14–6	3.727	58–74 (36–46)	110–127 (69–79)	*2	*1	100–116 (63–73)	40–55 (25–34)	47–63 (29–39)
205/70 SR14	3.727	57–72 (36–45)	105–121 (66–76)	*3	*1	96–111 (60–69)	39–53 (24–33)	45–60 (28–38)

*1 4 → 3 down shift possible up to maximum speed.

*2 No 3 → 4 shift up with throttle valve fully open. 3 → 4 shift up point with closed throttle valve is at 38 – 53 km/h (24 – 33 mph).

*3 No 3 → 4 shift up with throttle valve fully poen. 3 → 4 shift up point with closed throttle valve is at 37 – 51 km/h (23 – 32 mph).

–Note–

Tire size and tire inflation pressure should be as specified.

Specifications (Cont'd)

Valve body spring mm lin.)		Free length	Coil outer diamteer	No. coils	Wire diameter
	Lower valve body				
	1-2 shift valve	34.62 (1.3630)	7.56 (0.2976)	13	0.56 (0.0220)
	Pressure relief valve ball	32.14 (1.2654)	13.14 (0.5173)	9	2.03 (0.0799)
	Primary regulator valve	73.32 (2.8866)	16.72 (0.6583)	15	1.59 (0.0626)
	3-4 shift valve	33.65 (1.3248)	10.60 (0.4173)	14.5	1.10 (0.0433)
	Check valve (for oil cooler)	33.32 (1.3118)	13.82 (0.5441)	7	1.32 (0.0520)
	Damping ball	20.00 (0.7874)	4.97 (0.1957)	16	0.40 (0.0157)
	Rear upper valve body				
	2-3 shift timing valve	35.10 (1.3819)	8.96 (0.3528)	12.5	0.76 (0.0299)
	Sequence valve	37.55 (1.4783)	9.17 (0.3610)	14.5	1.17 (0.0461)
	Governor modulator valve	36.07 (1.4201)	9.09 (0.3579)	12	0.71 (0.0280)
	Low coast modulator valve	42.35 (1.6673)	9.24 (0.3638)	15	0.84 (0.0331)
	Detent regulator valve	29.93 (1.1783)	8.85 (0.3484)	13.5	0.90 (0.0354)
	Intermediate modulator valve	27.26 (1.0732)	9.04 (0.3559)	9.5	1.10 (0.0433)
	Front upper valve body				
	Throttle valve	19.24 (0.7575)	8.58 (0.3378)	8	0.71 (0.0280)
	Down shift plug	39.71 (1.5634)	10.89 (0.4287)	11.5	1.19 (0.0469)
	Secondary regulator valve	71.27 (2.8059)	17.43 (0.6862)	15	1.93 (0.0760)

Clutch and brake return spring (C_0, C_1, C_2)	Free length		14.90 mm	0.5866 in.
	Coil outer diameter		7.7 mm	0.303 in.
	No. of coils		6	
Clutch and brake return spring (B_0, B_1, B_2, B_3)	Free length		16.12 mm	0.6346 in.
	Coil outer diameter		8.0 mm	0.315 in.
	No. of coils		6	
Clutch and brake disc	Thickness	Limit	More than 2.1 mm (0.083 in.)	
Oil pump	Side clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
		Limit	0.1 mm	0.004 in.
	Body clearance	STD	0.07 – 0.15 mm	0.0028 – 0.0059 in.
		Limit	0.3 mm	0.012 in.
	Tip clearance Driven gear	STD	0.11 – 0.14 mm	0.0043 – 0.0055 in.
		Limit	0.3 mm	0.012 in.
Clutch and brake piston stroke	Front clutch (C_1)	STD	1.84 – 2.86 mm	0.0724 – 0.1126 in.
	Rear clutch (C_2)	STD	1.24 – 2.12 mm	0.0488 – 0.0835 in.
	OD clutch (C_0)	STD	1.55 – 2.28 mm	0.0610 – 0.0898 in.
	No.1 brake (B_1)	STD	0.65 – 1.30 mm	0.0256 – 0.0512 in.
	No.2 brake (B_2)	STD	1.24 – 2.12 mm	0.0488 – 0.0835 in.
Brake clearance	No.3 brake (B_3)	STD	0.72 – 2.50 mm	0.0283 – 0.0984 in.
	OD brake (B_0)	STD	0.35 – 1.60 mm	0.0138 – 0.0630 in.

Specifications (Cont'd)

Accumulator piston mm (in.)			Length		Outer diameter	
	B_2	Front	48.5 (1.764)		34.8 (1.266)	
	C_2	Center	45.0 (1.637)		31.8 (1.252)	
	C_1	Rear	49.5 (1.949)		31.8 (1.252)	
Accumulator piston spring mm (in.)			Free length	Coil outer diameter	No. coils	Wire diameter
	B_2	Front	66.50 (2.6181)	17.91 (0.7051)	13.5	2.60 (0.1024)
	C_2	Center	55.18 (2.1724)	15.87 (0.6248)	8.5	2.00 (0.0787)
	C_1	Rear	64.80 (2.5512)	17.20 (0.6772)	13	2.00 (0.0787)
Bushing bore mm (in.)	Bushing name		Length	Finished bore		Bore limit
	Stator support	Front	9.70 (0.3819)	21.501 – 21.527 (0.8465 – 0.8475)		21.577 (0.8495)
		Rear	17.45 (0.6870)	21.501 – 21.527 (0.8465 – 0.8475)		21.577 (0.8495)
	Oil pump body		13.46 (0.5299)	38.113 – 38.138 (1.5005 – 1.5015)		38.188 (1.5035)
	O/D sun gear	Front & Rear	9.70 (0.3819)	23.062 – 23.088 (0.9080 – 0.9090)		23.138 (0.9109)
	O/D input shaft		9.00 (0.3543)	11.200 – 11.221 (0.4409 – 0.4418)		11.271 (0.4437)
	Sun gear	Front & Rear	13.50 (0.5315)	21.501 – 21.527 (0.8465 – 0.8475)		21.577 (0.8495)
	Center support		60.07 (2.3650)	36.386 – 36.411 (1.4325 – 1.4335)		36.461 (1.4355)
	Transmission case		13.46 (0.5299)	38.113 – 38.138 (1.5005 – 1.5015)		38.188 (1.5035)
	Output shaft		9.70 (0.3819)	18.001 – 18.026 (0.7087 – 0.7096)		18.076 (0.7117)
	Extension housing		29.75 (1.1713)	38.000 – 38.025 (1.4961 – 1.4970)		38.075 (1.4990)

Tightening Torque (A43D)(RN 4×2)

Tightening part		kg-m	ft-lb
Engine x Transmission		5.0 – 8.0	37 – 57
Transmission housing	2 bolts	4.8 – 6.8	35 – 49
	4 bolts	2.7 – 4.2	20 – 30
Extension housing		2.7 – 4.2	20 – 30
Drive plate		6.0 – 7.0	43 – 50
Torque converter		1.5 – 2.2	11 – 15
Oil pump		1.8 – 2.5	14 – 18
Center support		2.4 – 2.8	18 – 20
Upper valve body x Lower valve body		0.5 – 0.6	44 – 52 in.-lb
Valve body		0.8 – 1.2	70 –104 in.-lb
Oil strainer		0.5 – 0.6	44 – 52 in.-lb
Oil pan		0.4 – 0.5	35 – 43 in.-lb
Oil pump cover bolt		0.6 – 0.9	53 – 78 in.-lb
Cooler pipe union nut		2.0 – 3.0	15 – 21
Testing plug		0.6 – 0.9	53 – 78 in.-lb
Parking lock pawl bracket		0.6 – 0.9	53 – 78 in.-lb

PROPELLER SHAFT (RN 4×2)

Specifications

Spider axial play			Less than 0.05 mm (0.0020 in.)	
Spider bearing selection (RN ½ ton)				
Part No.		Mark		
37402-30010	Bearing cup outer diameter	None	29.008 – 29.021 mm	1.1420 – 1.1426 in.
	Bearing hole inner diameter	None	29.000 – 29.021 mm	1.1417 – 1.1426 in.
37402-30020	Bearing cup outer diameter	Red	29.028 – 29.041 mm	1.1428 – 1.1433 in.
	Bearing hole inner diameter	Drill mark	29.021 – 29.042 mm	1.1426 – 1.1434 in.
Snap ring thickness (RN ½ ton)				
	Part No.	Color		
	90520-26233	None	1.475 – 1.525 mm	0.0581 – 0.0600 in.
	90520-26234	Brown	1.525 – 1.575 mm	0.0600 – 0.0620 in.
	90520-26235	Blue	1.575 – 1.625 mm	0.0620 – 0.0640 in.
Spider bearing selection (RN ¾ ton and RN C&C)				
Part No.		Mark		
37402-25010	Bearing cup outer diameter	None	26.015 – 26.028 mm	1.0242 – 1.0247 in.
	Bearing hole inner diameter	None	26.000 – 26.021 mm	1.0236 – 1.0244 in.
37402-25020	Bearing cup outer diameter	Red	26.036 – 26.049 mm	1.0250 – 1.0255 in.
	Bearing hole inner diameter	Drill mark	26.021 – 26.042 mm	1.0244 – 1.0253 in.

Specifications (Cont'd)

Hole snap ring thickness (RN ¾ ton and RN C&C)				
	Part No.	Color		
	90521-29070	None	2.375 – 2.425 mm	0.0935 – 0.0955 in.
	90521-29071	Brown	2.425 – 2.475 mm	0.0955 – 0.0974 in.
	90521-29072	Blue	2.475 – 2.525 mm	0.0974 – 0.0994 in.
Runout		Limit	0.8 mm	0.031 in.

Tightening Torque

Tightening part		kg-m	ft-lb
Universal joint flange yoke x Companion flange		3.0 – 5.0	22 – 36
Center bearing bracket x Member		1.5 – 2.0	11 – 14
Intermediate shaft x Center bearing x Joint flange	1st	17.0 – 20.0	123 – 144
	2nd	Loosen nut	
	3rd RN ½ ton	2.5 – 3.5	19 – 25
	RN ¾ ton, C & C	3.0 – 4.0	22 – 28

FRONT AXLE AND SUSPENSION (RN 4×2)

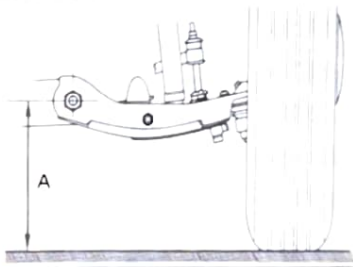
Specifications

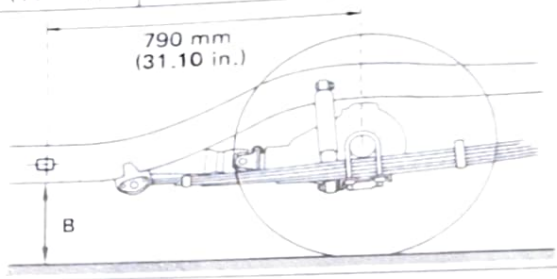
Cold tire inflation pressure kg/cm² (psi)	Model	Tire size			
	RN34L RN44L	Front	E78–14 (B) ER78–14 (B) 205/70 SR 14	1.7 (24)	*
		Rear	E78–14 (B) ER78–14 (B) 205/70 SR 14	2.2 (32)	
	RN34L RN44L	Front	7.00–14–6PR	1.7 (24)	*
		Rear	7.00–14–6PR	2.5 (36)	
	RN44L-KH RN44L-3W	Front	7.50–14–6PR	1.7 (24)	**
		Rear	7.50–14–6PR	2.5 (36)	
	* Do not drive over 120 km/h (75 mph) with cargo above 400 kg (882 lb). ** Do not drive over 120 km/h (75 mph) with cargo above 600 kg(1,323 lb).				

Front wheel alignment			Inspection STD	Adjustment STD	Left right error
	Toe-in	Bias tire	5±4 mm (0.20±0.16 in.)	5±1 mm (0.20±0.04 in.)	
		Radial tire	2±4 mm (0.08±0.16 in.)	2±1 mm (0.08±0.04 in.)	
	Camber		1°5′ ± 45′	1°5′ ± 30′	30′
	Caster	RN½ ton	1° ± 45′	1° ± 30′	30′
		RN¾ ton, C&C	30′ ± 45′	30′ ± 30′	
	King pin inclination		7°10′ ± 45′		±30′
	Wheel angle	Inside	36° $^{+1°}_{-2°}$		
		Outside	29°		
	Side slip		Within ± 3.0 mm/m (0.118 in./3.3 ft)		
	– Note – Difference of camber and caster between left and right sides must be within 30′.				

Specifications (Cont'd)

Vehicle height mm (in.)	Model	Pay load	Tire size	Unloaded		Loaded	
				Front (A)	Rear (B)	Front (A)	Rear (B)
	RN34, RN44 (OPT)	1/2 ton	7.00–14–6PR	261.4 (10.291)	288.3 (11.350)	242.3 (9.539)	231.0 (9.094)
	RN34, RN44	1/2 ton	E78–14(B)	254.4 (10.016)	281.3 (11.075)	235.3 (9.264)	224.0 (8.819)
	RN34, RN44–SR, SR-5	1/2 ton	ER78–14(B)	250.6 (9.866)	271.0 (10.669)	231.3 (9.106)	205.0 (8.071)
	RN34, RN44–SR, SR-5 (OPT)	1/2 ton	205/70 SR 14	241.6 (9.512)	262.0 (10.315)	222.3 (8.752)	196.0 (7.717)
	RN44L-KH	3/4 ton	7.50–14–6PR	278.4 (10.961)	305.3 (12.020)	259.3 (10.209)	248.0 (9.764)
	RN44L-3W	C&C	7.50–14–6PR	278.4 (10.961)	305.3 (12.020)	259.3 (10.209)	248.0 (9.764)





Front axle and suspension	Wheel bearing preload (starting load at hub bolt)	0.6 – 1.8 kg	1.3 – 4.0 lb
	Ball joints vertical play Limit	Max. 2.3 mm (0.091 in.)	

Tightening Torque

Tightening part	kg-m	ft-lb
Upper arm shaft x Suspension member	7.0 – 9.0	51 – 65
Lower arm shaft x Suspension member	20.0 – 30.0	145 – 216
Lower arm x Torque arm	4.0 – 5.5	29 – 39
Anker arm x Adjust bolt lock nut	7.0 – 9.0	51 – 65
Upper ball joint x Steering knuckle	9.0 – 13.0	66 – 94
Lower ball joint x Steering knuckle	12.0 – 17.0	87 – 122
Lower ball joint x Lower arm	2.0 – 3.0	15 – 21
Upper ball joint x Upper arm	2.0 – 3.0	15 – 21
Steering knuckle x Disc brake caliper		
RN ½ ton, ¾ ton	9.3 – 12.0	68 – 86
RN C&C	11.0 – 17.5	80 – 126
Steering knuckle x Knuckle arm	9.0 – 13.0	66 – 94
Wheel nut	9.0 – 12.0	66 – 86

REAR AXLE AND SUSPENSION (RN 4×2)

Specifications

7.5 in. Differential	Drive pinion bearing preload at Starting		
	New bearing	12 – 19 kg-cm	10.4–16.5 in.-lb
	Reused bearing	6 – 10 kg-cm	5.2 – 8.7 in.-lb
	Total preload at Starting	Add drive pinion bearing preload	
	New and reused bearing	4 – 6 kg-cm	3.5 – 5.2 in.-lb
	Drive pinion to ring gear backlash	0.13 – 0.18 mm	0.0051 – 0.0071 in.
	Pinion gear to side gear backlash	0.05 – 0.20 mm	0.0020 – 0.0079 in.
	Ring gear runout Limit	0.07 mm	0.0028 in.
	Companion flange runout Limit		
	Radial	0.10 mm	0.0039 in.
	Lateral	0.10 mm	0.0039 in.
	Ring gear installing temperature	90 – 110°C	194 – 230°F
	Side gear thrust washer thickness		
	Part No.		
	41361-30040	0.96 – 1.04 mm	0.0378 – 0.0409 in.
	41361-30050	1.06 – 1.14 mm	0.0417 – 0.0449 in.
	41361-30060	1.16 – 1.24 mm	0.0457 – 0.0488 in.
	41361-30070	1.26 – 1.34 mm	0.0496 – 0.0528 in.
	Drive pinion adjusting plate washer thickness		
	Part No.		
	90201-35434	2.23 – 2.25 mm	0.0878 – 0.0886 in.
	90201-35435	2.26 – 2.28 mm	0.0890 – 0.0898 in.
	90201-35436	2.29 – 2.31 mm	0.0902 – 0.0909 in.
	90201-35437	2.32 – 2.34 mm	0.0913 – 0.0921 in.
	90201-35396	2.35 – 2.37 mm	0.0925 – 0.0933 in.
	99201-35397	2.38 – 2.40 mm	0.0937 – 0.0945 in.
	90201-35398	2.41 – 2.43 mm	0.0949 – 0.0957 in.
	90201-35399	2.44 – 2.46 mm	0.0961 – 0.0969 in.
	90201-35400	2.47 – 2.49 mm	0.0972 – 0.0980 in.
	90201-35401	2.50 – 2.52 mm	0.0984 – 0.0992 in.
	90201-35402	2.53 – 2.55 mm	0.0996 – 0.1004 in.
	90201-35403	2.56 – 2.58 mm	0.1008 – 0.1016 in.
	90201-35404	2.59 – 2.61 mm	0.1020 – 0.1028 in.
	90201-35438	2.62 – 2.64 mm	0.1031 – 0.1039 in.
	90201-35439	2.65 – 2.67 mm	0.1043 – 0.1051 in.
	90201-35440	2.68 – 2.70 mm	0.1055 – 0.1063 in.
	90201-35441	2.71 – 2.73 mm	0.1067 – 0.1075 in.

Specifications (Cont'd)

8.0 in. Differential	Drive pinion bearing preload at Starting		
	New bearing	19 – 26 kg-cm	16.5 – 22.6 in.-lb
	Reused bearing	9 – 13 kg-cm	7.8 – 11.3 in.-lb
	Total preload at Starting	Add drive pinion bearing preload	
	New and reused bearing	4 – 6 kg-cm	3.5 – 5.2 in.-lb
	Drive pinion to ring gear backlash	0.13 – 0.18 mm	0.0051 – 0.0071 in.
	Pinion gear to side gear backlash	0.05 – 0.20 mm	0.0020 – 0.0079 in.
	Ring gear runout Limit	0.10 mm	0.0039 in.
	Companion flange runout Limit		
	Radial	0.10 mm	0.0039 in.
	Lateral	0.10 mm	0.0039 in.
	Ring gear installing temperature	90 – 110°C	194 – 230°F
	Side gear thrust washer thickness		
	Part No.		
	41361-40021	1.57 – 1.63 mm	0.0618 – 0.0642 in.
	41362-40021	1.67 – 1.73 mm	0.0657 – 0.0681 in.
	41363-40021	1.77 – 1.83 mm	0.0697 – 0.0720 in.
	Drive pinion adjusting plate washer thickness		
	Part No.		
	90201-35497	1.69 – 1.71 mm	0.0665 – 0.0673 in.
	90201-35498	1.72 – 1.74 mm	0.0677 – 0.0685 in.
	90201-35499	1.75 – 1.77 mm	0.0689 – 0.0697 in.
	90201-35500	1.78 – 1.80 mm	0.0701 – 0.0709 in.
	90201-35501	1.81 – 1.83 mm	0.0713 – 0.0720 in.
	90201-35502	1.84 – 1.86 mm	0.0724 – 0.0732 in.
	90201-35503	1.87 – 1.89 mm	0.0736 – 0.0744 in.
	90201-35504	1.90 – 1.92 mm	0.0748 – 0.0756 in.
	90201-35505	1.93 – 1.95 mm	0.0760 – 0.0768 in.
	90201-35506	1.96 – 1.98 mm	0.0722 – 0.0780 in.
	90201-35507	1.99 – 2.01 mm	0.0783 – 0.0791 in.
	90201-35508	2.02 – 2.04 mm	0.0795 – 0.0803 in.
	90201-35509	2.05 – 2.07 mm	0.0807 – 0.0815 in.
	90201-35510	2.08 – 2.10 mm	0.0819 – 0.0827 in.
	90201-35511	2.11 – 2.13 mm	0.0831 – 0.0839 in.
	90201-35512	2.14 – 2.16 mm	0.0843 – 0.0850 in.
	90201-35513	2.17 – 2.19 mm	0.0854 – 0.0862 in.
	90201-35514	2.20 – 2.22 mm	0.0866 – 0.0874 in.
	90201-35515	2.23 – 2.25 mm	0.0878 – 0.0886 in.
	90201-35516	2.26 – 2.28 mm	0.0890 – 0.0898 in.
	90201-35517	2.29 – 2.31 mm	0.0902 – 0.0909 in.
	90201-35518	2.32 – 2.34 mm	0.0913 – 0.0921 in.

Specifications (Cont'd)

8.0 in. Differential (cont'd)	Drive pinion bearing preload adjusting shim thickness		
	Part No.		
	90564-30035	0.25 mm	0.0098 in.
	90564-30193	0.30 mm	0.0118 in.
	90564-30194	0.35 mm	0.0138 in.
	90564-30195	0.40 mm	0.0157 in.
	90564-30063	0.45 mm	0.0177 in.

Tightening Torque

	Tightening part		kg-m	ft-lb
Differential (7.5 in., 8.0 in.)	Drive pinion x Companion flange	7.5 in.	11.0 – 24.0	80 – 173
		8.0 in.	17.0 – 21.0	123 – 151
	Ring gear x Differential case		9.2 – 10.5	67 – 75
	Differential carrier x Side bearing cap		7.0 – 9.0	51 – 65
	Differential carrier x Axle housing		2.0 – 3.0	15 – 21
Rear axle and suspension	Rear axle housing x Backing plate x Bearing retainer		6.0 – 8.0	44 – 57
	U-bolt nut		8.0 – 12.0	58 – 86
	Spring bracket pin		7.5 – 11.0	55 – 79
	Wheel nut		9.0 – 12.0	66 – 86

BRAKE (RN 4×2)

Specifications

Brake pedal	Pedal height (from floor panel)		157 – 167 mm	6.18 – 6.57 in.
	Pedal freeplay		3 – 6 mm	0.12 – 0.24 in.
	Pedal reserve distance (from floor panel) at 50kg (110 lb)		More than 76.2 mm (3.000 in.)	
Brake booster	Booster push rod to piston clearance			
		at Idling vacuum	0.1 – 0.5 mm	0.004 – 0.020 in.
		at No vacuum	0.60 – 0.65 mm	0.0236 – 0.0256 in.
		w/ SST	0 mm	0 in.
Front brake (Disc)	Disc thickness	Limit		
		RN ½ ton, ¾ ton	11.5 mm	0.453 in.
		RN C&C	19.0 mm	0.748 in.
	Disc runout	Limit	0.15 mm	0.0059 in.
	Pad thickness	Limit	1.0 mm	0.039 in.

Specifications (Cont'd)

Rear brake (Drum)	Drum inner diameter	Limit	256.0 mm	10.079 in.
	Lining thickness	Limit	1.0 mm	0.039 in.
Parking brake	Lever travel	at 20 kg (44 lb)	7 – 15 clicks	

Tightening Torque

Tightening part		kg-m	ft-lb
Brake booster clevis lock nut		1.9 – 3.1	14 – 22
Brake booster x Pedal bracket		1.0 – 1.6	8 – 11
Master cylinder x Brake booster		1.0 – 1.6	8 – 11
Reservoir set bolt x Master cylinder		2.0 – 3.0	15 – 21
Outlet plug x Master cylinder	ϕ16 mm	3.5 – 5.5	26 – 39
	ϕ18 mm	5.3 – 8.4	39 – 60
Piston stopper bolt x Master cylinder		0.8 – 1.5	70 – 130 in.-lb
Union bolt x Master cylinder		4.0 – 9.0	29 – 65
P & B valve x Bracket (RN ½ ton)		1.0 – 1.6	8 – 11
Brake tube union nut		1.3 – 1.8	10 – 13
Vacuum hose clamp x Dash panel		0.4 – 0.7	35 – 61 in.-lb
Check valve bracket x Dash panel		0.4 – 0.7	35 – 61 in.-lb
Disc brake caliper x Knuckle			
	RN ½ ton, ¾ ton	9.3 – 12.0	68 – 86
	RN C & C	11.0 – 17.5	80 – 126
Flexible hose		2.0 – 2.7	15 – 19
Brake tube union nut		1.3 – 1.8	10 – 13
Bleeder plug		0.9 – 1.3	79 – 112 in.-lb
Disc brake dust cover x Knuckle			
	12 mm bolt	9.0 – 13.0	66 – 94
	8 mm bolt	1.0 – 1.6	8 – 11
Front disc x Front axle hub			
	RN ½ ton, ¾ ton	4.0 – 5.5	29 – 39
	RN C&C	5.5 – 7.5	40 – 54
Cylinder guide plate x Disc brake mounting			
	RN C&C	4.0 – 6.0	29 – 44
Drum brake backing plate x Rear axle housing		6.0 – 8.0	44 – 57
Rear brake wheel cylinder x Backing plate			
	RN ½ ton, ¾ ton	0.8 – 1.2	70 – 104 in.-lb
	RN C&C	1.0 – 1.9	8 – 13

Tightening Torque (Cont'd)

Tightening part		kg-m	ft-lb
Rear brake bleeder plug	RN ½ ton, ¾ ton	0.9 – 1.3	79 – 112 in.-lb
	RN C&C	0.7 – 1.0	61 – 86 in.-lb
LSPV bracket x Frame	RN ¾ ton, C&C	1.5 – 2.2	11 – 15
LSPV x LSPV bracket	RN ¾ ton, C&C	1.0 – 1.6	8 – 11
LSPV spring x LSPV bracket	RN ¾ ton, C&C	1.5 – 2.2	11 – 15
LSPV spring x Shackle	RN ¾ ton, C&C	1.5 – 2.2	11 – 15
LSPV shackle lock nut	RN ¾ ton, C&C	1.9 – 3.1	14 – 22
LSPV shackle x Shackle bracket	RN ¾ ton, C&C	1.0 – 1.6	8 – 11
LSPV shackle bracket x Rear axle housing	RN ¾ ton, C&C	1.5 – 2.2	11 – 15

STEERING (RN 4×2)

Specifications

Steering	Steering wheel freeplay		Less than 30 mm (1.18 in.)	
	Intermediate shaft trunnion joint radial play at main shaft housing		Max. 0.06 mm (0.0024 in.)	
	Trunnion joint bearing lock width			
		Part No. Punch mark		
		45224-30040 Yes	15.97 – 16.00 mm	0.6287 – 0.6299 in.
		45225-30040 No	16.00 – 16.03 mm	0.6299 – 0.6311 in.
	Sector shaft to bushing clearance		0.062 – 0.107 mm	0.0024 – 0.0042 in.
	Bushing bore		28.072 – 28.097 mm	1.1052 – 1.1062 in.
	Sector shaft to needle bearing clearance			
		Upper	Less than 0.030 mm (0.0012 in.)	
		Lower	Less than 0.030 mm (0.0012 in.)	
	Sector shaft outer diameter		27.990 – 28.010 mm	1.1020 – 1.1028 in.
	Sector shaft thrust clearance	Limit	0.05 mm	0.0020 in.
	Sector shaft thrust washer thickness			
		Part No.		
		45353-20010	1.95 mm	0.0768 in.
		45352-20010	2.00 mm	0.0787 in.
		45354-20010	2.05 mm	0.0807 in.
		45355-20010	2.10 mm	0.0827 in.
		45356-20010	2.15 mm	0.0846 in.
	Worm bearing preload	w/o Sector shaft	3 – 5 kg-cm	2.6 – 4.3 in.-lb
		w/ Sector shaft	6 – 8.5 kg-cm	5.2 – 7.4 in.-lb

Specifications (Cont'd)

Power steering	Maximum rise of oil level		Below 5 mm (0.20 in.)	
	Oil pressure at Idle speed		More than 72 kg/cm² (1,024 psi)	
	Variation in vane pump discharge pressure (at 1,000 rpm and 3,000 rpm)		Less than 5 kg/cm² (71 psi)	
	Drive belt tension (w/ Borroughs drive belt tension gauge No. BT-33-73F)			
		New belt	125 ± 25 lb	
		Used belt	80 ± 20 lb	
	Steering effort at Steering wheel		Less than 3.5 kg (7.7 lb)	
	Vane plate	Length STD	15.00 mm	0.5906 in.
		Limit	14.97 mm	0.5894 in.
		Height STD	8.2 mm	0.323 in.
		Limit	7.8 mm	0.307 in.
		Width STD	1.8 mm	0.071 in.
		Limit	1.7 mm	0.067 in.
	Vane plate to vane plate groove clearance			
		Limit	0.06 mm	0.0024 in.
	Shaft to bushing clearance	STD	0.010 – 0.030 mm	0.0004 – 0.0012 in.
		Limit	0.07 mm	0.0028 in.
	Flow control valve spring length	STD	50.0 mm	1.969 in.
		Limit	47.0 mm	1.850 in.
	Pump preload (at pump pulley) rotating		0.5 kg	1.1 lb
	Cross shaft adjusting screw thrust clearance		0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Ball clearance	STD	0.02 – 0.06 mm	0.0008 – 0.0024 in.
		Limit	0.15 mm	0.0059 in.
	Worm shaft preload at Starting			
		w/o Cross shaft	4.0 – 6.5 kg-cm	3.5 – 5.6 in.-lb
		w/ Cross shaft	In addition to without cross shaft preload	
			2 – 3 kg-cm	1.7 – 2.6 in.-lb
Tilt steering	Collar No. 1 outer diameter	Part No.		
		45813-22010	17.996 – 18.003 mm	0.7085 – 0.7088 in.
		45813-22020	18.003 – 18.010 mm	0.7088 – 0.7091 in.
		45813-22030	18.010 – 18.017 mm	0.7091 – 0.7093 in.
		45813-22040	18.017 – 18.024 mm	0.7093 – 0.7096 in.
		45813-22050	17.989 – 17.996 mm	0.7082 – 0.7085 in.
	Collar No. 2 outer diameter	Part No.		
		45814-22010	17.982 – 18.000 mm	0.7080 – 0.7087 in.
		45814-22020	18.000 – 18.018 mm	0.7087 – 0.7094 in.

Specifications (Cont'd)

Tilt steering (cont'd)	Tilt steering support shim thickness Part No.		
	45815-22010	0.2 mm	0.008 in.
	45815-22020	0.5 mm	0.020 in.
	45815-22030	0.8 mm	0.031 in.
	45815-22040	1.4 mm	0.055 in.
	45815-22050	1.8 mm	0.071 in.

Tightening Torque

Steering	Tightening part	kg-m	ft-lb
	Steering wheel x Steering main shaft	3.0 – 4.0	22 – 28
	Breakaway bracket x Instrument plane	1.9 – 3.1	14 – 22
	Flexible coupling x Steering worm	2.0 – 3.0	15 – 21
	Flexible coupling x Steering intermediate shaft	2.0 – 3.0	15 – 21
	Sector shaft end cover x Gear housing	1.5 – 2.2	11 – 15
	Steering upper bracket x Steering column	0.4 – 0.7	35 – 60 in.-lb
	Worm bearing adjusting screw lock nut	23.0 – 26.0	167 – 188
	Pitman arm x Sector shaft	11.0 – 12.5	80 – 90
	Steering gear housing x Frame	5.0 – 6.0	37 – 43
	Pitman arm x Relay rod	7.5 – 11.0	55 – 79
	Relay rod x Tie rod	7.5 – 11.0	55 – 79
	Relay rod x Idler arm	5.0 – 7.0	37 – 50
	Idler arm support x Frame	5.0 – 6.0	37 – 43
	Idler arm support x Idler arm	8.0 – 12.0	58 – 86
	Knuckle arm x Tie rod	7.5 – 11.0	55 – 79
	Tie rod end clamp	2.0 – 3.0	15 – 21
	Shimmy damper x Relay rod	5.0 – 7.0	37 – 50
	Shimmy damper x Frame	1.0 – 1.6	8 – 11
Power steering	Pump pulley x Rotor shaft	4.5 – 5.5	33 – 39
	Front housing x Rear housing	4.0 – 5.5	29 – 39
	Worm bearing adjusting screw lock nut	4.5 – 5.5	33 – 39
	Gear housing x Valve housing	4.0 – 5.5	29 – 39
	End cover x Gear housing	4.0 – 5.5	29 – 39
	Cross shaft adjusting screw lock nut	4.0 – 5.5	29 – 39
	Pressure hose union nut	4.0 – 5.0	29 – 36
	Return pipe union bolt	4.5 – 5.5	32 – 39
	Gear housing x Frame	5.0 – 6.0	37 – 47
	Cross shaft x Pitman arm	11.0 – 12.5	80 – 90

Tightening Torque (Cont'd)

Tilt steering	Tightening part	kg-m	ft-lb
	Tilt steering pawl set bolt	1.5 – 2.2	11 – 15
	Tilt lever retainer	1.5 – 2.2	11 – 15
	Castle nut (Support x Breakaway bracket)	1.5 – 2.2	11 – 15
	Support stopper bolt	0.8 – 1.2	70 – 104 in.-lb
	Upper bracket x Tilt steering support	0.6 – 0.9	53 – 78 in.-lb
	Breakaway bracket x Column tube	1.5 – 2.2	11 – 15
	Main shaft x Intermediate shaft	2.0 – 3.0	15 – 21

LUBRICANTS (RN 4×2)

Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Engine oil				API grade SE or Better
Dry fill	4.8	5.1	4.2	
Drain and refill				
w/ Oil filter change	4.6	4.9	4.0	
w/o Oil filter change	3.8	4.0	3.3	
Manual transmission oil				API GL-4 or GL-5
L48	2.0	2.1	1.8	SAE 80W-90
W50	2.6	2.7	2.3	SAE 75W-90 or 80W-90
A/T fluid				ATF type F
Dry fill	6.5	6.9	5.7	
Drain and refill	2.4	2.5	2.1	
Differential oil				API GL-5 hypoid gear oil
7.5 in.	1.7	1.8	1.5	Above –18°C (0°F) SAE 90
8.0 in.	1.8	1.9	1.6	Below –18°C (0°F) SAE 80W-90 or 80W
Power steering fluid				ATF type Dexron
Pump	300 cc	18.3 cu in.		
Total	850 cc	51.9 cu in.		
Steering gear box oil	380 – 400 cc	23.2 – 24.4 cu in.		API GL-4, SAE 90
Ball joint grease	—			Molybdenum disulphide lithium base, NLGI No. 1 or No. 2
Wheel bearing grease	—			Lithium base multipurpose, NLGI No. 2
Brake fluid	—			SAE J1703, DOT 3
Antifreeze	—			Anti-rust type ethylene-glycol base coolant

CLUTCH AND MANUAL TRANSMISSION (RN 4×4)

Specifications

Clutch	Pedal height (from floor panel)		152 – 162 mm	5.98 – 6.38 in.
	Pedal freeplay		5 – 15 mm	0.20 – 0.59 in.
	Release fork end play		None adjustable type	
	Disc rivet head depth	Limit	0.3 mm	0.012 in.
	Disc runout	Limit	0.8 mm	0.031 in.
	Diaphragm spring out of alignment	Limit	0.5 mm	0.020 in.
	Diaphragm spring finger wear	Limit	0.6 mm	0.024 in.
Manual transmission (L45, L52)	Gear thrust clearance			
	1st, 2nd, 3rd & Countershaft 5th (L52) gear			
		STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.25 mm	0.0098 in.
	3rd gear to output shaft oil clearance	STD	0.0090 – 0.0325 mm	0.0004 – 0.0013 in.
		Limit	0.0325 mm	0.0013 in.
	2nd gear to output shaft oil clearance	STD	0.0090 – 0.0325 mm	0.0004 – 0.0013 in.
		Limit	0.0325 mm	0.0013 in.
	1st gear to roller and bushing oil clearance			
		STD	0.009 – 0.032 mm	0.0004 – 0.0013 in.
		Limit	0.032 mm	0.0013 in.
	Countershaft 5th gear to roller and shaft oil clearance (L52)	STD	0.009 – 0.032 mm	0.0004 – 0.0013 in.
		Limit	0.032 mm	0.0013 in.
	Reverse idler to shaft oil clearance	STD	0.040 – 0.082 mm	0.0016 – 0.0032 in.
		Limit	0.082 mm	0.0032 in.
	Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	Synchronizer ring to gear clearance	Limit	0.8 mm	0.031 in.
	Output shaft runout	Limit	0.05 mm	0.0020 in.
	Input shaft snap ring thrust clearance		0 – 0.10 mm	0 – 0.0039 in.
	Snap ring thickness Part No.	Mark		
	90520-30214	0	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	90520-30215	1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	90520-30216	2	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	90520-30217	3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	90520-30218	4	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	90520-30219	5	2.30 – 2.35 mm	0.0906 – 0.0925 in.

Specifications (Cont'd)

Manual transmission (L45, L52) (cont'd)	Output shaft snap ring thrust clearance (for Rear)		0 – 0.10 mm	0 – 0.0039 in.
	Snap ring thickness	Part No. Mark		
		90520-25005 A	2.67 – 2.72 mm	0.1051 – 0.1071 in.
		90520-25006 B	2.73 – 2.78 mm	0.1075 – 0.1094 in.
		90520-25009 C	2.79 – 2.84 mm	0.1098 – 0.1118 in.
		90520-25010 D	2.85 – 2.90 mm	0.1122 – 0.1141 in.
		90520-25011 E	2.91 – 2.96 mm	0.1146 – 0.1165 in.
		90520-25012 F	2.97 – 3.02 mm	0.1169 – 0.1189 in.
		90520-25013 G	3.03 – 3.08 mm	0.1193 – 0.1213 in.
		90520-25014 H	3.09 – 3.14 mm	0.1217 – 0.1236 in.
		90520-25015 J	3.15 – 3.20 mm	0.1240 – 0.1260 in.
		90520-25016 K	3.21 – 3.26 mm	0.1264 – 0.1283 in.
		90520-25017 L	3.27 – 3.32 mm	0.1287 – 0.1307 in.
	Output shaft snap ring thrust clearance (for Front)		0 – 0.10 mm	0 – 0.0039 in.
	Snap ring thickness	Part No. Mark		
		90520-28245 D	1.80 – 1.85 mm	0.0709 – 0.0728 in.
		90520-28010 D-1	1.85 – 1.90 mm	0.0728 – 0.0748 in.
		90520-28246 E	1.90 – 1.95 mm	0.0748 – 0.0768 in.
		90520-28011 E-1	1.95 – 2.00 mm	0.0768 – 0.0787 in.
		90520-28248 F	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	Counter gear front bearing snap ring thrust clearance		0 – 0.10 mm	0 – 0.0039 in.
	Snap ring thickness	Part No. Mark		
		90520-23115 1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		90520-23089 2	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		90520-23143 3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		90520-23090 4	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		90520-23144 5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		90520-23145 6	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	Gear shift arm shoe end thickness	Limit	7.5 mm	0.295 in.
	Gear shift arm shoe to groove clearance	Limit	0.6 mm	0.024 in.
	Bimetal formed bushing to propeller shaft oil clearance		0.025 – 0.075 mm	0.0010 – 0.0030 in.
	Bimetal formed bushing inside diameter		38.020 – 38.045 mm	1.4968 – 1.4978 in.
	Extension housing bushing installing temperature		80 – 100°C	176 – 212°F

Tightening Torque

	Tightening part	kg-m	ft-lb
Clutch	Clutch cover x Flywheel	1.5 – 2.2	11 – 15
	Clutch housing x Engine	5.0 – 8.0	37 – 57
	Master cylinder reservoir set bolt	2.0 – 3.0	15 – 21
	Release fork support x Clutch housing	3.0 – 4.5	22 – 32
	Strap x Clutch pressure plate	2.0 – 3.0	15 – 21
Manual transmission (L45, L52)	Transmission case x Adapter	4.0 – 5.5	29 – 39
	Front bearing retainer x Transmission case	2.0 – 2.8	15 – 20
	Output shaft rear bearing retainer x Transmission case	1.5 – 2.2	11 – 15
	Counter gear rear lock nut	11.0 – 14.0	80 – 101
	Case cover x Transmission case	1.5 – 2.2	11 – 15
	Select outer lever lock bolt	1.9 – 3.1	14 – 22

TRANSFER (RN 4×4)

Specifications

Output shaft bearing thrust clearance		Less than 0.1 mm (0.004 in.)	
Output shaft snap ring thickness			
Part No.	Mark		
90520-36250	0	2.40 – 2.45 mm	0.0945 – 0.0965 in.
90520-36251	1	2.45 – 2.50 mm	0.0965 – 0.0984 in.
90520-36252	2	2.50 – 2.55 mm	0.0984 – 0.1004 in.
90520-36253	3	2.55 – 2.60 mm	0.1004 – 0.1024 in.
90520-36254	4	2.60 – 2.65 mm	0.1024 – 0.1043 in.
90520-36255	5	2.65 – 2.70 mm	0.1043 – 0.1063 in.
Output shaft runout	Limit	0.03 mm	0.0012 in.
Low gear to output shaft oil clearance	STD	0.010 – 0.055 mm	0.0004 – 0.0022 in.
	Limit	0.075 mm	0.0030 in.
Low gear thrust clearance	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
	Limit	0.30 mm	0.0118 in.
Transfer drive gear to output shaft oil clearance			
	STD	0.009 – 0.051 mm	0.0004 – 0.0020 in.
	Limit	0.071 mm	0.0028 in.
Transfer drive gear thrust clearance	STD	0.09 – 0.27 mm	0.0035 – 0.0106 in.
	Limit	0.32 mm	0.0126 in.
Input shaft bearing thrust clearance		Less than 0.15 mm (0.0059 in.)	

Specifications (Cont'd)

Input shaft snap ring thickness				
	Part No.	Mark		
	90520-33168	1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	90520-33170	3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	90520-33172	5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
Counter shaft bearing thrust clearance			Less than 0.15 mm (0.0059 in.)	
Counter shaft snap ring thickness				
	Part No.	Mark		
	90520-30215	1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	90520-30217	3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
Idler gear shaft bearing thrust clearance			Less than 0.15 mm (0.0059 in.)	
Idler gear shaft snap ring thickness				
	Part No.	Mark		
	90520-28242	A	1.50 – 1.55 mm	0.0591 – 0.0610 in.
	90520-28243	B	1.60 – 1.65 mm	0.0630 – 0.0650 in.
Shift fork to clutch sleeve clearance		Limit	1.0 mm	0.039 in.

Tightening Torque

Tightening part	kg-m	ft-lb
Adapter x Reduction case	3.0 – 4.5	22 – 32
Reduction case x Front case x Rear case	3.0 – 4.5	22 – 32
Rear case x Extension housing	3.0 – 4.5	22 – 32
Front case x Rear case	3.0 – 4.5	22 – 32
Reduction case x Front case	3.0 – 4.5	22 – 32
Reduction case x P.T.O. cover	0.5 – 0.9	44 – 78 in.-lb
Output shaft x Companion flange	11.0 – 14.0	80 – 101
Front drive gear bearing retainer x Front case	1.5 – 2.2	11 – 15

PROPELLER SHAFT (RN 4×4)

Specifications

Spider axial play			Less than 0.05 mm (0.0020 in.)	
Spider bearing selection				
Part No.		Mark		
37402-30010	Bearing cup outer diameter	None	29.008 – 29.021 mm	1.1420 – 1.1426 in.
	Bearing hole inner diameter	None	29.000 – 29.021 mm	1.1417 – 1.1426 in.
37402-30020	Bearing cup outer diameter	Red	29.028 – 29.041 mm	1.1428 – 1.1433 in.
	Bearing hole inner diameter	Drill mark	29.021 – 29.042 mm	1.1426 – 1.1434 in.
Snap ring thickness	Part No.	Color		
	90520-26233	None	1.475 – 1.525 mm	0.0581 – 0.0600 in.
	90520-26234	Brown	1.525 – 1.575 mm	0.0600 – 0.0620 in.
	90520-26235	Blue	1.575 – 1.625 mm	0.0620 – 0.0640 in.
Runout		Limit	0.8 mm	0.031 in.

Tightening Torque

Tightening part	kg-m	ft-lb
Propeller shaft x Transfer	3.0 – 5.0	22 – 36
Propeller shaft x Differential	3.0 – 5.0	22 – 36

FRONT AXLE AND SUSPENSION (RN 4×4)

Specifications

Cold tire inflation pressure kg/cm² (psi)	Tire size		Low speed driving	High speed driving
	H78 – 15 (B) HR78 – 15 (B)	Front	1.4 (20)	1.7 (24)
		Rear	1.7 (24)	2.0 (28)
Front wheel alignment			Inspection STD	Adjustment STD
	Toe-in	H78–15(B) Bias tire	4±4 mm (0.16±0.16 in.)	4±1 mm (0.16±0.04 in.)
		HR78–15(B) Radial tire	1±4 mm (0.04±0.16 in.)	1±1 mm (0.04±0.04 in.)
	Camber		1° ± 45′	←
	Caster	at Unloaded	3°30′ ± 45′	←
	King pin inclination		9°30′ ± 45′	
	Wheel angle	Inside	30°30′ $^{+1^\circ}_{-2^\circ}$	
		Outside	29°	
	Side slip		within ± 3.0 mm/m (±0.118 in./3.3 ft)	
Front axle and suspension	Wheel bearing preload (starting load at hub bolt)		2.8 – 5.7 kg	6.2 – 12.6 lb
	Steering knuckle bearing preload (rotating) at Knuckle arm end		1.8 – 3.8 kg	4.0 – 8.4 lb
	Steering knuckle preload adjusting shim thickness	Part No.		
		43236-60010	0.1 mm	0.004 in.
		43233-60011	0.2 mm	0.008 in.
		43234-60011	0.5 mm	0.020 in.
		43235-60010	1.0 mm	0.039 in.

Tightening Torque

Tightening part	kg-m	ft-lb
Steering knuckle arm x Housing	8.5 – 11.0	62 – 79
Bearing cap x Housing	8.5 – 11.0	62 – 79
U-bolt nut	10.0 – 15.0	73 – 108
Spring bracket pin	7.5 – 11.0	55 – 79
Wheel nut	9.0 – 12.0	66 – 86
Hub x Flange	2.8 – 3.5	21 – 25
Adjusting nut	8.0 – 10.0	58 – 72

REAR AXLE AND SUSPENSION (RN 4×4)

Specifications

8.0 in. Differential	Drive pinion bearing preload	at Starting	
		New bearing	19 – 26 kg-cm (16.5 – 22.6 in.-lb)
		Reused bearing	9 – 13 kg-cm (7.8 – 11.3 in.-lb)
	Total preload	at Starting	Add drive pinion bearing preload
		New and reused bearing	4 – 6 kg-cm (3.5 – 5.2 in.-lb)
	Drive pinion to ring gear backlash		0.13 – 0.18 mm (0.0051 – 0.0071 in.)
	Pinion gear to side gear backlash		0.05 – 0.20 mm (0.0020 – 0.0079 in.)
	Ring gear runout	Limit	0.10 mm (0.0039 in.)
	Companion flange runout	Limit	
		Radial	0.10 mm (0.0039 in.)
		Lateral	0.10 mm (0.0039 in.)
	Ring gear installing temperature		90 – 110°C (194 – 230°F)
	Side gear thrust washer thickness		
		Part No.	
		41361-40021	1.57 – 1.63 mm (0.0618 – 0.0642 in.)
		41362-40021	1.67 – 1.73 mm (0.0657 – 0.0681 in.)
		41363-40021	1.77 – 1.83 mm (0.0697 – 0.0720 in.)
	Drive pinion adjusting plate washer thickness		
		Part No.	
		90201-35497	1.69 – 1.71 mm (0.0665 – 0.0673 in.)
		90201-35498	1.72 – 1.74 mm (0.0677 – 0.0685 in.)
		90201-35499	1.75 – 1.77 mm (0.0689 – 0.0697 in.)
		90201-35500	1.78 – 1.80 mm (0.0701 – 0.0709 in.)
		90201-35501	1.81 – 1.83 mm (0.0713 – 0.0720 in.)
		90201-35502	1.84 – 1.86 mm (0.0724 – 0.0732 in.)
		90201-35503	1.87 – 1.89 mm (0.0736 – 0.0744 in.)
		90201-35504	1.90 – 1.92 mm (0.0748 – 0.0756 in.)
		90201-35505	1.93 – 1.95 mm (0.0760 – 0.0768 in.)
		90201-35506	1.96 – 1.98 mm (0.0772 – 0.0780 in.)
		90201-35507	1.99 – 2.01 mm (0.0783 – 0.0791 in.)
		90201-35508	2.02 – 2.04 mm (0.0795 – 0.0803 in.)
		90201-35509	2.05 – 2.07 mm (0.0807 – 0.0815 in.)
		90201-35510	2.08 – 2.10 mm (0.0819 – 0.0827 in.)
		90201-35511	2.11 – 2.13 mm (0.0831 – 0.0839 in.)
		90201-35512	2.14 – 2.16 mm (0.0843 – 0.0850 in.)
		90201-35513	2.17 – 2.19 mm (0.0854 – 0.0862 in.)
		90201-35514	2.20 – 2.22 mm (0.0866 – 0.0874 in.)
		90201-35515	2.23 – 2.25 mm (0.0878 – 0.0886 in.)
		90201-35516	2.26 – 2.28 mm (0.0890 – 0.0898 in.)
		90201-35517	2.29 – 2.31 mm (0.0902 – 0.0909 in.)
		90201-35518	2.32 – 2.34 mm (0.0913 – 0.0921 in.)

Specifications (Cont'd)

8.0 in. Differential (cont'd)	Drive pinion bearing preload adjusting shim thickness	Part No.		
		90564-30035	0.25 mm	0.0098 im.
		90564-30193	0.30 mm	0.0118 in.
		90564-30194	0.35 mm	0.0138 in.
		90564-30195	0.40 mm	0.0157 in.
		90564-30063	0.45 mm	0.0177 in.

Tightening Torque

	Tightening part	kg-m	ft-lb
Differential (8.0 in.)	Drive pinion x Companion flange	17.0 – 21.0	123 – 151
	Ring gear x Differential case	9.2 – 10.5	67 – 75
	Differential carrier x Side bearing cap	7.0 – 9.0	51 – 65
	Differential carrier x Axle housing	2.0 – 3.0	15 – 21
Rear axle and suspension	Rear axle housing x Backing plate x Bearing retainer	6.0 – 8.0	44 – 57
	U-bolt nut	10.0 – 15.0	73 – 108
	Spring bracket pin	7.5 – 11.0	55 – 79
	Wheel nut	9.0 – 12.0	66 – 86

BRAKE (RN 4×4)

Specifications

Brake pedal	Pedal height (from floor panel)		157 – 167 mm	6.18 – 6.57 in.
	Pedal freeplay		3 – 6 mm	0.12 – 0.24 in.
	Pedal reserve distance (from floor panel) at 50kg (110 lb)		More than 85 mm (3.35 in.)	
Brake booster	Booster push rod to piston clearance			
		at Idling vacuum	0.1 – 0.5 mm	0.004 – 0.020 in.
		at No vacuum	0.60 – 0.65 mm	0.0236 – 0.0256 in.
		w/ SST	0 mm	0 in.
Front brake (Disc)	Disc thickness	Limit	11.5 mm	0.453 in.
	Disc runout	Limit	0.15 mm	0.0059 in.
	Pad thickness	Limit	1.0 mm	0.039 in.
Rear brake (Drum)	Drum inner diameter	Limit	256.0 mm	10.079 in.
	Lining thickness	Limit	1.0 mm	0.039 in.
Parking brake	Lever travel	at 20 kg (44 lb)	7 – 15 clicks	

Tightening Torque

Tightening part	kg-m	ft-lb
Brake booster clevis lock nut	1.9 – 3.1	14 – 22
Brake booster x Pedal bracket	1.0 – 1.6	8 – 11
Master cylinder x Brake booster	1.0 – 1.6	8 – 11
Reservoir set bolt x Master cylinder	2.0 – 3.0	15 – 21
Outlet plug x Master cylinder	3.5 – 5.5	26 – 39
Piston stopper bolt x Master cylinder	0.8 – 1.5	70 – 130 in.-lb
Union bolt x Master cylinder	4.0 – 9.0	29 – 65
Brake tube union nut	1.3 – 1.8	10 – 13
Vacuum hose clamp x Dash panel	0.4 – 0.7	35 – 61 in.-lb
Check valve bracket x Dash panel	0.4 – 0.7	35 – 61 in.-lb
Disc brake caliper x Knuckle	7.5 – 10.5	55 – 75
Flexible hose	2.0 – 2.7	15 – 19
Brake tube union nut	1.3 – 1.8	10 – 13
Bleeder plug	0.9 – 1.3	79 – 112 in.-lb
Disc brake dust cover x Knuckle	4.0 – 5.5	29 – 39
Front disc x Front axle hub	4.0 – 5.5	29 – 39
Flexible hose bracket x Dust cover	1.0 – 1.6	8 – 11
Drum brake backing plate x Rear axle housing	6.0 – 8.0	44 – 57
Rear brake wheel cylinder x Backing plate	1.0 – 1.9	8 – 13
Rear brake bleeder plug	0.7 – 1.0	61 – 86 in.-lb
Bellcrank bracket x Backing plate	1.0 – 1.6	8 – 11
Bellcrank stopper bolt lock nut	0.4 – 0.7	35 – 60 in.-lb
LSPV bracket x Frame	1.5 – 2.2	11 – 15
LSPV x LSPV bracket	1.0 – 1.6	8 – 11
LSPV spring x LSPV bracket	1.5 – 2.2	11 – 15
LSPV spring x Shackle	1.5 – 2.2	11 – 15
LSPV shackle lock nut	1.9 – 3.1	14 – 22
LSPV shackle x Shackle bracket	1.0 – 1.6	8 – 11
LSPV shackle bracket x Rear axle housing	1.5 – 2.2	11 – 15

STEERING (RN 4×4)

Specifications

Steering	Steering wheel freeplay		Less than 30 mm (1.18 in.)	
	Intermediate shaft spider axial play		Less than 0.05 mm (0.0020 in.)	
	Snap ring thickness			
	Part No.	Mark		
	80521-22011	None	1.175 – 1.225 mm	0.0463 – 0.0482 in.
	80521-22012	Brown	1.225 – 1.275 mm	0.0482 – 0.0502 in.
	80521-22013	Blue	1.275 – 1.325 mm	0.0502 – 0.0522 in.

Specifications(Cont'd)

Steering (cont'd)	Sector shaft to bushing clearance STD	0.01 – 0.06 mm	0.0004 – 0.0024 in.
	Limit	0.1 mm	0.004 in.
	Sector shaft thrust clearance Limit	0.05 mm	0.0020 in.
	Sector shaft bushing bore STD	32.00 – 32.03 mm	1.2598 – 1.2610 in.
	Limit	32.07 mm	1.2626 in.
	Sector shaft outer diameter STD	31.970 – 31.992 mm	1.2587 – 1.2595 in.
	Limit	31.95 mm	1.2579 in.
	Worm bearing preload at Starting		
	w/o Sector shaft	3.5 – 6.5 kg-cm	3.0 – 5.6 in.-lb
	w/ Sector shaft	In addition to without sector shaft preload	
		4.5 kg-cm	3.9 in.-lb
	Sector shaft thrust washer thickness		
	Part No.		
	45352-36010	2.00 mm	0.0787 in.
	45353-36010	2.05 mm	0.0807 in.
	45354-36010	2.10 mm	0.0827 in.
	45355-36010	2.15 mm	0.0846 in.
	45356-36010	2.20 mm	0.0866 in.
	Gear housing end cover shim thickness		
	Part No.		
	45323-36010	0.05 mm	0.0020 in.
	45323-36070	0.06 mm	0.0024 in.
	45323-36020	0.07 mm	0.0028 in.
	45323-36030	0.08 mm	0.0031 in.
	45323-36080	0.09 mm	0.0035 in.
	45323-36040	0.10 mm	0.0039 in.
	45323-36050	0.20 mm	0.0079 in.
	45323-36060	0.50 mm	0.0197 in.
Power steering	Maximum rise of oil level	Below 5 mm (0.20 in.)	
	Oil pressure at Idle speed	More than 62 kg/cm^2 (882 psi)	
	Variation in vane pump discharge pressure (at 1,000 rpm and 3,000 rpm)	Less than 5 kg/cm^2 (71 psi)	
	Drive belt tension (w/ Borroughs drive belt tension gauge No. BT-33-73F)		
	New belt	125 ± 25 lb	
	Used belt	80 ± 20 lb	

Specifications (Cont'd)

Power steering (cont'd)	Steering effort	at Steering wheel	Less than 3.5 kg (7.7 lb)	
	Vane plate	Length STD	15.00 mm	0.5906 in.
		Limit	14.97 mm	0.5894 in.
		Height STD	8.2 mm	0.323 in.
		Limit	7.8 mm	0.307 in.
		Width STD	1.8 mm	0.071 in.
		Limit	1.7 mm	0.067 in.
	Vane plate to vane plate groove clearance			
		Limit	0.06 mm	0.0024 in.
	Shaft to bushing clearance	STD	0.010 – 0.030 mm	0.0004 – 0.0012 in.
		Limit	0.07 mm	0.0025 in.
	Flow control valve spring length	STD	50.0 mm	1.969 in.
		Limit	47.0 mm	1.850 in.
	Pump preload (at pump pulley) rotating		0.5 kg	1.1 lb
	Cross shaft adjusting screw thrust clearance		0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Ball clearance	STD	0.02 – 0.06 mm	0.0008 – 0.0024 in.
		Limit	0.15 mm	0.0059 in.
	Worm shaft preload	at Starting		
		w/o Cross shaft	4.0 – 6.5 kg-cm	3.5 – 5.6 in.-lb
		w/ Cross shaft	In addition to without cross shaft preload	
			2 – 3 kg-cm	1.7 – 2.6 in.-lb
Tilt steering	Collar No. 1 outer diameter	Part No.		
		45813-22010	17.996 – 18.003 mm	0.7085 – 0.7088 in.
		45813-22020	18.003 – 18.010 mm	0.7088 – 0.7091 in.
		45813-22030	18.010 – 18.017 mm	0.7091 – 0.7093 in.
		45813-22040	18.017 – 18.024 mm	0.7093 – 0.7096 in.
		45813-22050	17.989 – 17.996 mm	0.7082 – 0.7085 in.
	Collar No. 2 outer diameter	Part No.		
		45814-22010	17.982 – 18.000 mm	0.7080 – 0.7087 in.
		45814-22020	18.000 – 18.018 mm	0.7087 – 0.7094 in.
	Tilt steering support shim thickness			
		Part No.		
		45815-22010	0.2 mm	0.008 in.
		45815-22020	0.5 mm	0.020 in.
		45815-22030	0.8 mm	0.031 in.
		45815-22040	1.4 mm	0.055 in.
		45815-22050	1.8 mm	0.071 in.

Tightening Torque

Steering	Tightening part	kg-m	ft-lb
	Steering wheel x Steering main shaft	3.0 – 4.0	22 – 28
	Breakaway bracket x Instrument panel	1.9 – 3.1	14 – 22
	Steering upper bracket x Steering column	0.4 – 0.7	35 – 60 in.-lb
	Worm gear end cover x Gear housing	3.0 – 4.5	22 – 32
	Sector shaft end cover x Gear housing	3.0 – 4.5	22 – 32
	Gear box x Bracket	5.0 – 6.5	37 – 47
	Steering gear housing bracket x Frame	5.0 – 6.5	37 – 47
	Pitman arm x Sector shaft	16.0 – 19.0	116 – 137
	Tie rod x Knuckle arm	7.5 – 11.0	55 – 79
	Tie rod end clamp	2.0 – 3.0	15 – 21
	Steering worm x Steering intermediate shaft	3.0 – 4.5	22 – 32
	Steering intermediate shaft x Main shaft	3.0 – 4.5	22 – 32
	Steering damper x Tie rod end	5.0 – 7.0	37 – 50
	Steering damper x Front axle housing	1.0 – 1.6	8 – 11
Power steering	Pump pulley x Rotor shaft	4.5 – 5.5	33 – 39
	Front housing x Rear housing	4.0 – 5.5	29 – 39
	Worm bearing adjusting screw lock nut	4.5 – 5.5	33 – 39
	Gear housing x Valve housing	4.0 – 5.5	29 – 39
	End cover x Gear housing	4.0 – 5.5	29 – 39
	Cross shaft adjusting screw lock nut	4.0 – 5.5	29 – 39
	Pressure hose union nut	4.0 – 5.0	29 – 36
	Return pipe union nut	4.0 – 5.0	29 – 36
	Gear housing x Bracket	5.0 – 6.5	37 – 47
	Cross shaft x Pitman arm	16.0 – 19.0	116 – 137
Tilt steering	Tilt steering pawl set bolt	1.5 – 2.2	11 – 15
	Tilt lever retainer	1.5 – 2.2	11 – 15
	Castle nut (Support x Breakaway bracket)	1.5 – 2.2	11 – 15
	Support stopper bolt	0.8 – 1.2	70 – 104 in.-lb
	Upper bracket x Tilt steering support	0.6 – 0.9	53 – 78 in.-lb
	Breakaway bracket x Column tube	1.5 – 2.2	11 – 15
	Main shaft x Intermediate shaft	2.0 – 3.0	15 – 21

LUBRICANTS (RN 4×4)

Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Engine oil				API grade SE or Better
Dry fill	4.8	5.1	4.2	
Drain and refill				
w/ Oil filter change	4.6	4.9	4.0	
w/o Oil filter change	3.8	4.0	3.3	
Transmission oil				API GL-4 or GL-5
L45	2.0	2.1	1.8	SAE 80W-90
L52	1.8	1.9	1.6	
Transfer oil	1.6	1.7	1.4	API GL-4 or GL-5, SAE 80W-90
Differential oil				API GL-5 hypoid gear oil
Front	2.2	2.3	1.9	Above −18°C (0°F)
Rear	2.2	2.3	1.9	SAE 90
				Below −18°C (0°F)
				SAE 80W-90 or 80W
Steering gear box oil	580 cc	35.4 cu in.		API GL-4, SAE 90
Power steering fluid				ATF type Dexron
Pump	300 cc	18.3 cu in.		
Total	850 cc	51.9 cu in.		
Chassis grease				
Propeller shaft (Except double cardan joint)				Lithium base, NLGI No. 1
Double cardan joint		—		Molybdenum disulphide lithium base, NLGI No. 2
Drag link ends and steering intermediate shaft slide yoke				Lithium base, NLGI No. 0
Wheel bearing grease		—		Lithium base multipurpose, NLGI No. 2
Steering knuckle and front axle shaft grease		—		Molybdenum disulphide lithium base, NLGI No. 2
Brake fluid		—		SAE J1703, DOT 3
Antifreeze		—		Anti-rust type ethylene-glycol base coolant

ELECTRICAL WIRING DIAGRAMS

INDEX

TOYOTA TRUCK (PICKUP) ELECTRICAL WIRING DIAGRAM (For USA & CANADA) – 1982 Model

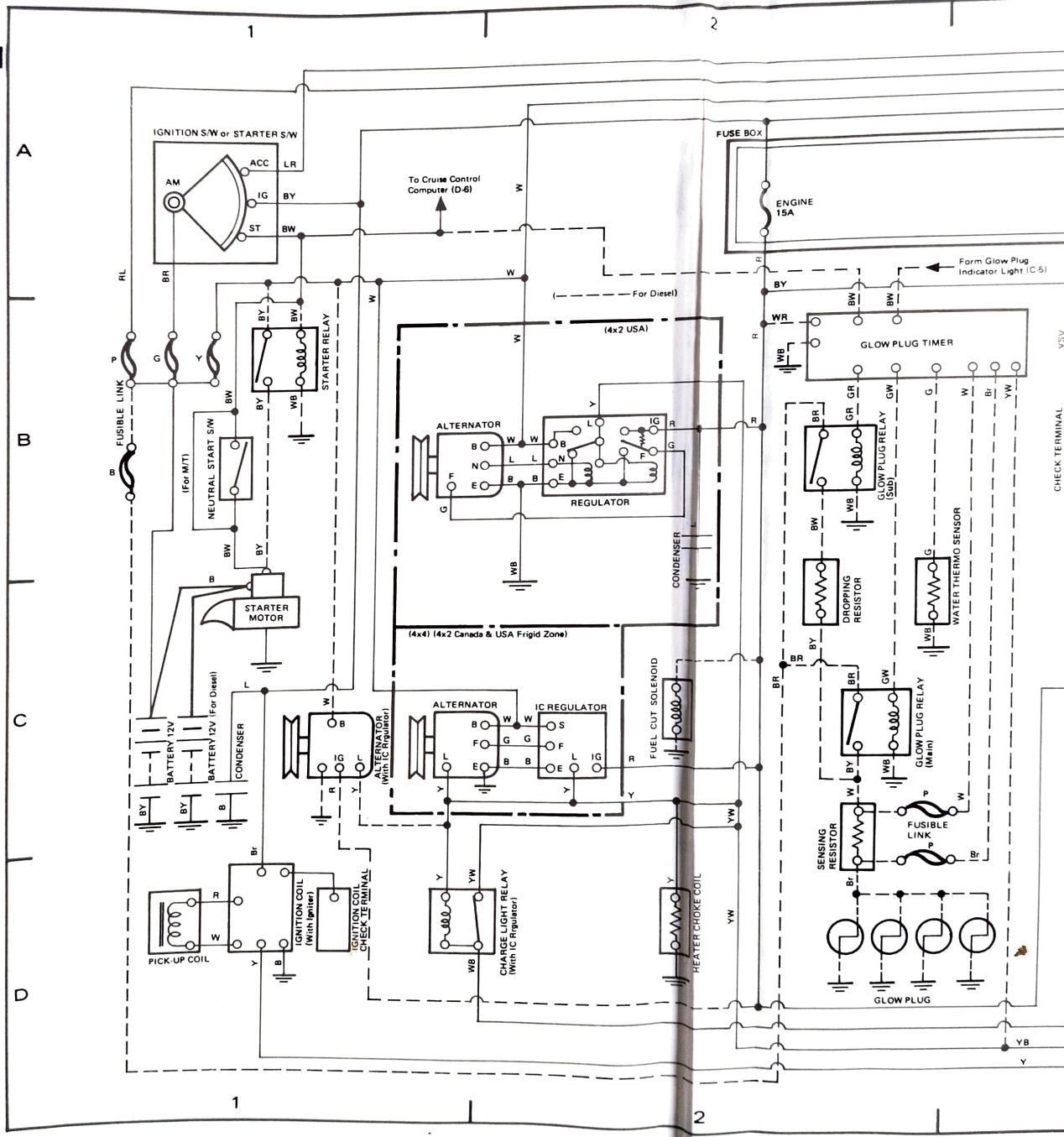
GRID LOCATION			COMPONENTS
Fig.1	Fig.2	Fig.3	
			A/C SYSTEM;
C-4	B-5	D	AMPLIFIER
B-4	B-6	D	HEATER BLOWER MOTOR
C-4	B-6	C	HEATER BLOWER SWITCH
B-4	B-6	C	HEATER RELAY
B-4	B-6	D	HEATER RESISTOR
D-4	–	D	LOW PRESSURE CUT SWITCH
D-4	–	B	MAGNET CLUTCH
D-4	–	D	THERMISTOR
D-4	–	D	THERMO CONTROL RESISTOR
D-4	–	B	VSV
B-1	D-3	A	ALTERNATOR (4x2 USA)
C-1	D-3	C-1	ALTERNATOR (4x4) (4x2 Canada & USA Frigid Zone)
C-1	A-2	B	ALTERNATOR (With IC Regulator) (For Diesel)
B-8	C-6	D	AM/FM MPX RADIO (OPT)
B-8 · C-8	–	A	ANTENNA
C-1	–	A, B	BATTERY
B-8	B-7	C	CIGARETTE LIGHTER
C-1	D-1	A	CONDENSER
B-2	D-4	A	CONDENSER
C-1	C-2	A	CONDENSER (Ex. USA Frigid Zone, 4x2 Canada)
C-5	A-3	B	CONDENSER (For Diesel)
			CRUISE CONTROL SYSTEM; (4x2)
D-6	D-4	A	ACTUATOR
D-6	D-6	C	CLUTCH SWITCH
C-6	B-5	D	COMPUTER
D-6 · D-3	C-8 · A-8	C	SPEED SENSOR
C-6	A-6	C	SWITCH
–	D-7	C	DIODE
D-8 · B-5	B-7	C	DIODE (For Diesel)
C-2	B-5	A	DROPPING RESISTOR (For Diesel)
C-8	C-6	C	ELECTRONIC TURNING RADIO
			EMISSON CONTROL SYSTEM;
B-3	D-4	A	(For California & C&C) CHECK TERMINAL (For California) (4x4 Frigid Zone)
B-3	D-5	D	COMPUTER
B-3	B-1	B	FUEL CUT SOLENOID
B-4	B-1	A	MAGNETIC VALVE
C-3	D-2	A	O_2 SENSOR (4x2 Ex. California & Frigid Zone)
C-3	D-3	A	O_2 SENSOR (4x4)
C-3	A-8 · C-8	C	SPEED SENSOR
C-4	C-3	B	THERMO SWITCH NO.1
C-4	C-3	B	THERMO SWITCH NO.2
C-3	D-5	F	TWC THERMO SENSOR
C-3	A-2	B	VACUUM SWITCH
B-3	B-3	B	VSV
B-3	B-3	B	VSV NO.1
B-3	B-4	B	VSV NO.2
			EMISSION CONTROL SYSTEM; (Ex. California & C & C)
D-3	C-4	A	CHECK TERMINAL (Ex. California)
C-3	D-5	D	COMPUTER
C-3	B-1	B	FUEL CUT SOLENOID
C-3	B-1	B	MAGNETIC VALVE
D-3	D-5	F	OC THERMO SENSOR
D-3	C-8	C	SPEED SENSOR
D-3	C-3	B	THERMO SWITCH (4x4 Ex. Canada)
D-3	A-2	B	VACUUM SWITCH
C-3	B-2	B	VSV (Ex. Canada)
C-3	B-4	B	VSV (EGR) (For M/T)
C-3	B-4	B	VSV NO.3
C-2	C-4	A	FUEL CUT SOLENOID (For Diesel)
C-5	B-8	C	FUEL GAUGE (Ex. SR-5)
C-5	C-8	C	FUEL GAUGE (For SR-5)
C-5	A-6	H	FUEL LEVEL SENDER
A-2	C-6	C	FUSE BOX
D-2 · B-1	B-2	A	FUSIBLE LINK
D-2	–	A	GLOW PLUG (For Diesel)
B-2	C-5	C	GLOW PLUG TIMER (For Diesel)
D-2	B-1	D	HEATER CHOKE COIL
B-6	A-1	B	HORN
C-2	C-2	A	IC REGULATOR (4x4) (4x2 Canada & USA Frigid Zone)
D-1	D-4	A	IGNITION COIL (With Igniter)
D-1	–	A	IGNITION COIL CHECK TERMINAL
			LIGHTS;
C-7	A-6	C	A/T INDICATOR
C-5	B-8	J	BACK-UP, RH
C-4	C-8	I	BACK-UP, LH
D-5	A-7	I	BRAKE WARNING (Ex. SR-5)
D-5	D-7	C	BRAKE WARNING (For SR-5)

GRID LOCATION			COMPONENTS
Fig.1	Fig.2	Fig.3	
D-5	A-7	C	CHARGE WARNING (Ex. SR-5)
D-5	C-8	C	CHARGE WARNING (For SR-5)
C-7	A-1	B	CLEARANCE, RH
C-7	D-1	A	CLEARANCE, LH
C-7 · D-7	B-8	C	COMBINATION METER (Ex. SR-5)
C-7 · D-7	C-8	C	COMBINATION METER (For SR-5)
C-7	A-1	B	FRONT SIDE MARKER, RH
C-1	D-1	A	FRONT SIDE MARKER, LH
C-5	A-8	C	GLOW PLUG INDICATOR (Ex. SR-5) (For Diesel)
B-7	B-1	B	HEAD, RH
B-7	D-1	A	HEAD, LH
C-7	B-6	C	HEATER CONTROL
B-7	B-8	C	HIGH BEAM INDICATOR (Ex. SR-5)
B-7	C-7	C	HIGH BEAM INDICATOR (For SR-5)
D-7	B-6	C	INSTRUMENT PANEL
C-8	D-7	E	INTERIOR
D-7	B-8	J	LICENSE PLATE, RH
D-7	C-8	I	LICENSE PLATE, LH
C-7 · D-7	A-6	C	OIL PRESSURE GAUGE (4x2)
C-7 · D-7	A-5	C	OIL PRESSURE GAUGE (4x4)
B-5	A-7	C	OIL PRESSURE WARNING (Ex. SR-5)
B-5	C-8	C	OIL PRESSURE WARNING (For SR-5)
C-7	B-8	J	REAR SIDE MARKER, RH
D-7	C-8	I	REAR SIDE MARKER, LH
C-7 · D-7	A-6	C	VOLT METER (4x2)
D-7 · C-7	A-5	C	VOLT METER (4x4)
B-5	A-8	C	SEDIMENTER WARNING (Ex. SR-5) (For Diesel)
B-5	C-8	C	SEDIMENTER WARNING (For SR-5) (For Diesel)
D-6	B-8	J	STOP, RH
D-6	C-8	I	STOP, LH
C-7	–	C	TACHOMETER
B-7	A-8	J	TAIL, RH
B-7	D-8	I	TAIL, LH
B-5	–	C	TIMING BELT WARNING
D-6	A-1	B	TURN SIGNAL, FRONT RH
C-6	D-1	A	TURN SIGNAL, FRONT LH
D-6	A-8	C	TURN SIGNAL, INDICATOR RH (Ex. SR-5)
D-6	D-8	C	TURN SIGNAL, INDICATOR LH (For SR-5)
D-6	B-8	J	TURN SIGNAL, REAR RH
C-6	C-8	I	TURN SIGNAL, REAR LH
C-5	B-8	C	4WD INDICATOR (Ex. SR-5)
C-5	C-7	C	4WD INDICATOR (For SR-5)
			MOTORS;
C-1	C-3	B	STARTER (4x4 California) (4x2 USA Ex. Frigid Zone)
C-1	B-3	B	STARTER (4x4 Canada)
C-1	C-5	A	STARTER (For Diesel)
C-1	C-3	B	STARTER (4x4 USA Ex. California) (4x2 USA Ex. California Frigid Zone With Cruise Control)
C-7	D-2	A	WINDSHIELD WASHER
C-7	A-4	B	WINDSHIELD WASHER (For Diesel)
D-7	A-4	B	WINDSHIELD WIPER
B-5	A-6	C	OIL PRESSURE GAUGE (4x2)
B-5	A-5	C	OIL PRESSURE GAUGE (4x4)
B-5	C-3	B	OIL PRESSURE SENDER (4x4 California) (4x2 USA Ex. California Frigid Zone)
B-5	B-3	B	OIL PRESSURE SENDER (4x4 Canada)
B-5	C-3	B	OIL PRESSURE SENDER (4x4 USA Ex. California) (4x2 USA Ex. California Frigid Zone)
B-6 · C-7	B-8	C	OVER DRIVE SYSTEM; (4x2 USA) INDICATOR LIGHT (Ex. SR-5)
C-7 · B-6	C-8	C	INDICATOR LIGHT (For SR-5)
B-6	B-6	C	MAIN SWITCH
B-6	B-7	C	RELAY
C-6	B-1	C	SOLENOID
D-1	–	A	PICK-UP COIL
B-8	A-6	C	RADIO

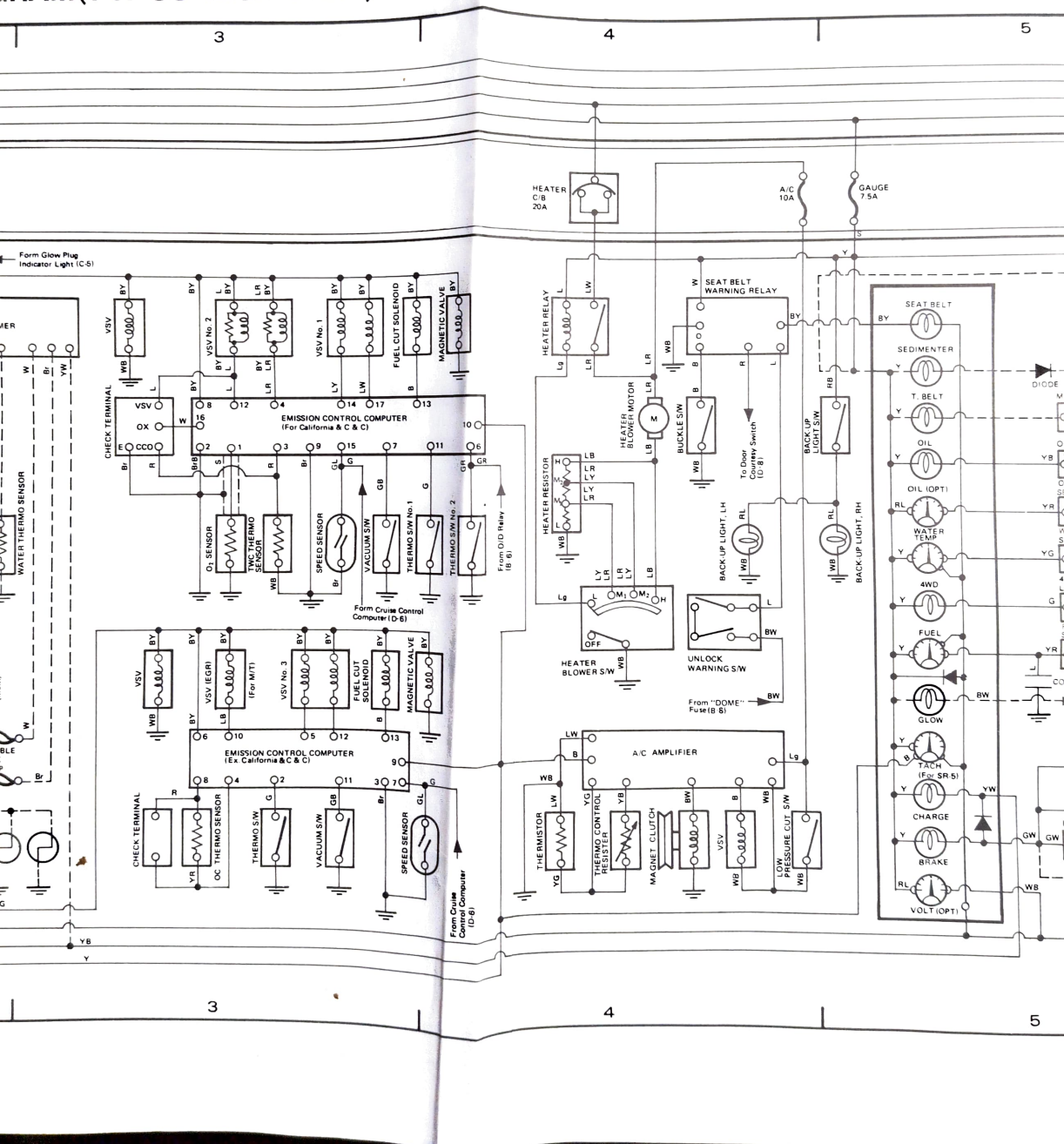
GRID LOCATION			COMPONENTS
Fig.1	Fig.2	Fig.3	
B-2	C-2	A	REGULATOR (4x2 USA)
D-7	B-7	C	RHEOSTAT
D-1	C-5	C	RELAYS; CHARGE LIGHT (With IC Regulater)
B-6	D-6	C	FLASHER
C-2	C-3 · B-4		GLOW PLUG (Main) (For Diesel)
B-2	A-2		GLOW PLUG (Sub) (For Diesel)
B-7	B-6	C	HEADLIGHT
B-1	–	B	STARTER
B-1	D-2	A	STARTER (For Diesel)
B-7	B-6	C	TAIL LIGHT
C-7	C-5	D	WIPER (Intermittent)
B-4	D-5	E	SEAT BELT SYSTEM; BUCKLE SWITCH
C-4	–	E	UNLOCK WARNING SWITCH
B-5	A-7	C	WARNING LIGHT (Ex. SR-5)
B-5	C-7	C	WARNING LIGHT (For SR-5)
B-4	B-5	D	WARNING RELAY
B-5	B-7		SEDIMENTER WARNING BUZZER (For Diesel)
D-2	B-4	A	SENSING RESISTOR (For Diesel)
B-8	–	D	SPEAKER
C-8	C-5	F	SPEAKER, RH
C-8	D-6	E	SPEAKER, LH
C-8	–	D	STEREO
			SWITCHES;
B-5	A-6	D	BACK-UP LIGHT
B-5	B-1	D	BACK-UP LIGHT
B-5	A-7	D	BACK-UP LIGHT
D-5	D-4	A	BRAKE FLUID LEVEL (Ex. Diesel)
D-5	B-3	A	BRAKE FLUID LEVEL (For Diesel)
B-5	–	C	CANCEL
B-7	C-7	C	DIMMER
D-8	C-5	D	DOOR COURTESY, RH
D-8	D-6	C	DOOR COURTESY, LH
B-6	C-7	C	HAZARD
C-6	B-7	C	HORN
A-1	B-6	C	IGNITION
C-8	–	E	INTERIOR LIGHT
B-7	C-7	C	LIGHT CONTROL
B-5	–	C	MILEAGE
B-1	B-1	D	NEUTRAL START (For A/T)
B-5	C-3	B	OIL PRESSURE (4x4 California) (4x2 USA)
B-5	B-3	B	OIL PRESSURE (4x4 Canada)
B-5	A-3	B	OIL PRESSURE (For Diesel)
B-5	C-3	B	OIL PRESSURE (4x4 USA Ex. California) (4x2 USA Ex. California Frigid Zone With Cruise Computer)
D-5	B-6	C	PKB
B-5	B-4	A	SEDIMENTER WARNING (For Diesel)
A-1	B-6	C	STARTER
C-6	B-7	C	STOP LIGHT
C6	C-7	C	TURN SIGNAL
D-5	A-4	B	VACUUM (For Diesel)
C-7	B-7	C	WINDSHIELD WASHER
C-7	B-7	C	WINDSHIELD WIPER
C-5	A-6	F	4WD INDICATOR LIGHT
C-5	C-8	C	TACHOMETER (For SR-5)
D-5	A-6	C	VOLT METER (4x2)
D-5	A-5	C	VOLT METER (4x4)
C-5	A-7	C	WATER TEMP GAUGE (Ex. SR-5)
C-5	C-8	C	WATER TEMP GAUGE (For SR-5)
C-5	C-3	B	WATER TEMP SENDER (4x4 California) (4x2 USA)
C-5	B-3	B	WATER TEMP SENDER (4x4 California) (4x2 USA)
C-5	C-4	A	WATER TEMP SENDER (For Diesel)
C-5	C-3	B	WATER TEMP SENDER (4x4 USA Ex. California) (4x2 USA Ex. California Frigid Zone With Cruise Control)
C-2	C-5	A	WATER THERMO SENSOR (For Diesel)

TOYOTA TRUCK(PICKUP) ELECTRICAL WIRING DIAGRAM(F

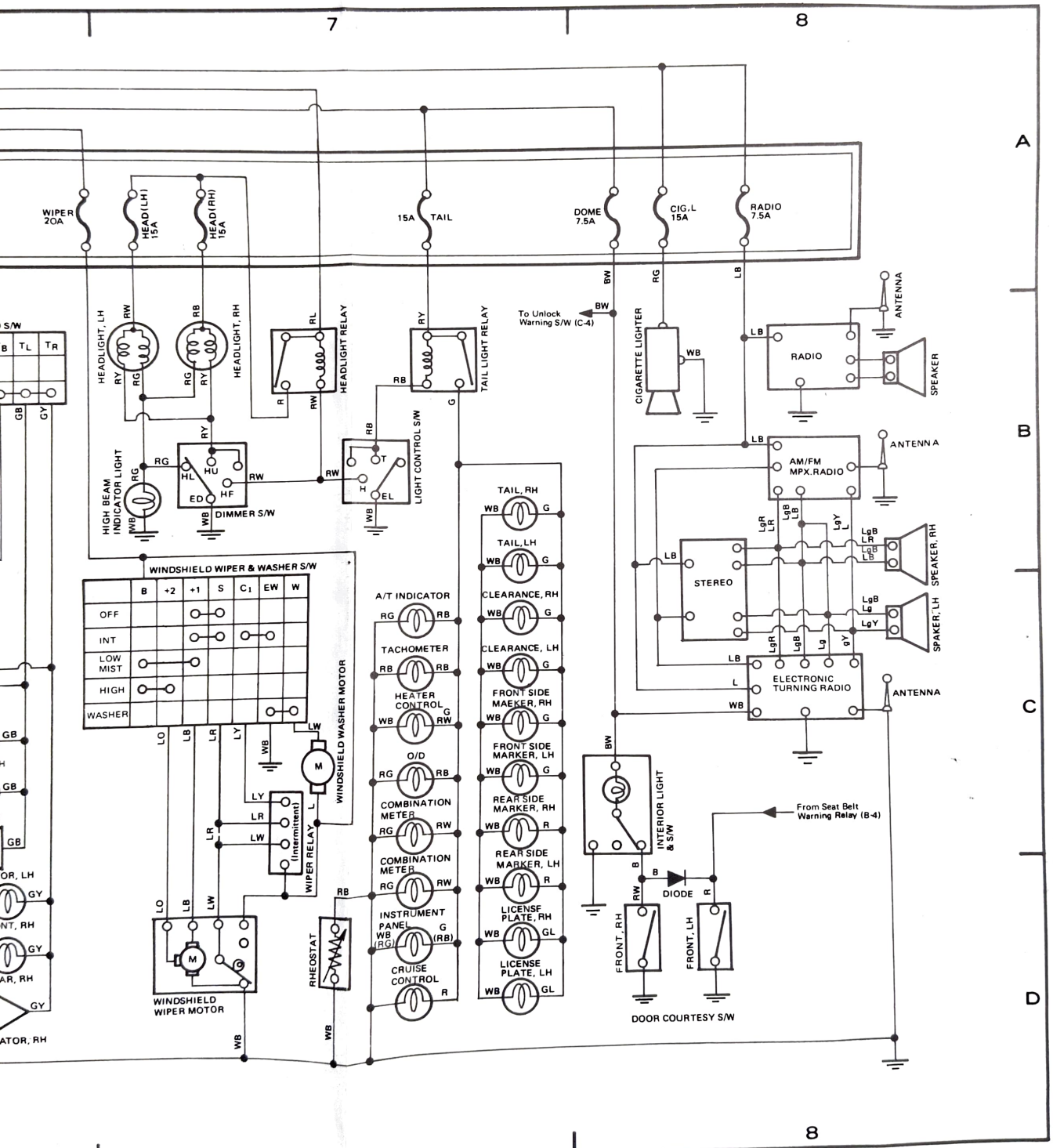
FiG. 1



GRAM(For USA&CANADA)–1982 Model



AMPLIFIER
VSV
LOW PRESSURE CUT S/W
From "IGNITION" Fuse (B-8)
UNLOCK WARNING S/W
BACK-UP LIGHT, LH
BUCKLE S/W
To Door Courtesy Switch (D-8)
SEAT BELT WARNING RELAY
A/C 10A
BACK-UP LIGHT S/W
BACK-UP LIGHT, RH
GAUGE 7.5A
VOLT (OPT)
BRAKE
CHARGE
TACHO (OPT)
GLOW
FUEL
4WD
WATER TEMP
OIL (OPT)
OIL
T. BELT
SEDIMENTER
SEAT BELT
PKB S/W
VACUUM S/W
BRAKE FLUID LEVEL S/W
CONDENSER
To Glow Plug Timer (B-7)
FUEL LEVEL SENDER
4WD INDICATOR LIGHT S/W
WATER TEMP SENDER
OIL PRESSURE SENDER
OIL PRESSURE S/W
MILEAGE S/W
DIODE
CANCEL S/W
SEDIMENTER WARNING BUZZER
SEDIMENTER WARNING S/W
To Speed Sensor (C-3) (D-3)
CRUISE CONTROL CLUTCH S/W
CRUISE CONTROL ACTUATOR
From Ignition S/W "ST" (A-1)
CRUISE CONTROL COMPUTER
CRUISE CONTROL S/W
O/D MAIN S/W
O/D INDICATOR LIGHT
O/D SOLENOID
O/D RELAY
To Thermo Switch (B-4)
STOP 15A
STOP LIGHT S/W
HORN S/W
HORN
HAZ-HORN 15A
STOP LIGHT, LH
STOP LIGHT, RH
TURN SIGNAL LIGHT
INDICATOR, RH
REAR, RH
FRONT, RH
INDICATOR, LH
REAR, LH
FRONT, LH
FLASHER RELAY
TURN SIGNAL S/W
HAZARD S/W
TURN 15A
WIPER 20A
WASHER
HIGH
LOW MIST
INT
OFF
HIGH BEAM INDICATOR LIGHT
HEADLIGHT, LH
HEAD(LH) 15A


7
8
A
B
C
D
WIPER 20A
HEAD(LH) 15A
HEAD(RH) 15A
15A TAIL
DOME 7.5A
CIG,L 15A
RADIO 7.5A
To Unlock Warning S/W (C-4)
HEADLIGHT, LH
HEADLIGHT, RH
HEADLIGHT RELAY
TAIL LIGHT RELAY
CIGARETTE LIGHTER
RADIO
ANTENNA
SPEAKER
HIGH BEAM INDICATOR LIGHT
DIMMER S/W
LIGHT CONTROL S/W
AM/FM MPX.RADIO
ANTENNA
STEREO
SPEAKER, RH
SPAKER, LH
ELECTRONIC TURNING RADIO
ANTENNA
WINDSHIELD WIPER & WASHER S/W
B
+2
+1
S
C1
EW
W
OFF
INT
LOW MIST
HIGH
WASHER
WINDSHIELD WASHER MOTOR
WIPER RELAY
(Intermittent)
WINDSHIELD WIPER MOTOR
RHEOSTAT
A/T INDICATOR
TACHOMETER
HEATER CONTROL
O/D
COMBINATION METER
COMBINATION METER
INSTRUMENT PANEL
CRUISE CONTROL
TAIL, RH
TAIL, LH
CLEARANCE, RH
CLEARANCE, LH
FRONT SIDE MAEKER, RH
FRONT SIDE MARKER, LH
REAR SIDE MARKER, RH
REAR SIDE MARKER, LH
LICENSE PLATE, RH
LICENSE PLATE, LH
INTERIOR LIGHT & S/W
From Seat Belt Warning Relay (B-4)
DIODE
FRONT, RH
FRONT, LH
DOOR COURTESY S/W